

HANDBOOK

FOR THE

5-INCH B.L. HOWITZER



1909.



LONDON:

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DIAGRAMS OF PACKING.

Carriage, Ammunition Wagon and Limbers	A and B
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PLATES.

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Note.—This handbook has been corrected up to March, 1909; any alterations which may be suggested should be forwarded to Chief Inspector, Royal Arsenal, Woolwich.

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5-INCH B.L. HOWITZER, 1909.

AMENDMENTS.

Page 34, line 16. *Delete* "gun wheels" and *substitute* "muzzle."

Page 36, under heading "DUTIES," line 4. *After* "the fuzes" *insert* "to see that they are correctly set."

Page 36. *Between* lines 17 and 18 from bottom *insert* "Breech and muzzle covers may be replaced if necessary."

Page 37, No. 4's duties. *Delete* "if the aiming point is on the left front, lays" and *after* "for direction" in the next line *insert* "except when the aiming point is in rear or on the right front."

Page 37, No. 5's duties. *After* "time fuzes" *insert* "clamping them as tight as possible.*" *Add* footnote—

"* Time fuzes should be securely clamped, to reduce the chances of prematures, caused by the slipping of the time ring."

Page 37, under "SIGNALS." *Insert* under "1" in the middle column "during ranging for elevation."

Page 38. *Delete* line 10.

Page 38, lines 13 and 14. *For* "As soon as the gun (if loaded) is reported layed," *substitute* "During ranging for elevation as soon as the gun is reported ready."

Page 38, line 19. *After* "brake" *add* "and marks the position of the right wheel."

Page 38, line 21. *After* "brake" *add* "and marks the position of the left wheel."

Page 38. *Delete* last two lines under heading "ACTION."

Page 39, line 9. *Delete* "Load" under Section Commander's orders.

Page 39, heading "TO FIRE." *For* first three lines *substitute* "A gun is not to be fired without an order from 1, and 1 must never give this order until he sees that the gun is in all respects ready, and, during ranging for elevation, until he has received the order from the section commander."

Page 39, heading "To FIRE." *Delete* "Fire No..... Gun" under Section Commander's orders, also *delete* the tenth line from bottom of page, and *substitute* "As soon as the gun is reported 'Ready'."

Page 39, line 4 from bottom of page. *Delete* "usually when over 30".

Page 40, line 11. *After* "further orders" *insert* "to its marked position."

Page 40, heading "Miss-Fire." *For* second paragraph *substitute* "Should miss-fires continue the breech may be opened, but an interval of at least one minute with black powder charges, and of ten minutes with smokeless powder charges, must be allowed to elapse after the last failure to fire the gun."

None of the detachment should be directly in rear of the breech when it is opened."

Page 41, heading "To LIMBER UP." *Delete* last two lines.

5-inch B.L. HOWITZER.

DESCRIPTION.

(Plate I.)

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Material	Steel.	
Weight	{ of howitzer, with fittings	9 cwt. 2 qr. 13 lb.	
	{ of breech fittings	3 qr. 5 lb.	
Length, total	49 inches.		
Bore	{ calibre	5 inches.	
	{ length	42 inches.	
Chamber	{ diameter	5.2 inches.	
	{ length	3.2 inches.	
	{ capacity	77 cubic inches.	
Rifling	{ system	Polygroove, hook section.	
	{ length	36.8 inches.	
	{ twist	Uniform, 1 turn in 28 cal.	
	{ grooves	{ number	20
		{ width6 of an inch.
{ depth .. ..		.05 of an inch.
Venting	Axial.		
Obturation	Pad.		
Firing Mechanism	Friction T-tube.		

The howitzer is made of steel, and consists of an A tube, over which is shrunk a B tube. Over the B tube is shrunk a jacket, the whole being secured longitudinally by means of shoulders on the A and B tubes, and a steel bush screwed into the B tube and jacket at the rear; the bush is also prepared for the reception of the breech screw. A breech ring, for attaching the howitzer to the hydraulic buffers, is fitted over the rear portion of the breech bush and screwed to the jacket. The breech ring and bush are prevented from turning, when in position, by a steel stud screwed through the breech ring, and partly into the bush and jacket, at the rear.

The breech ring is furnished with lugs for the attachment of the breech fittings.

Longitudinal projections formed on the sides of the jacket act as guides for the howitzer when in the cradle of the carriage; projections which serve as a plane for clinometer and seatings for the foresight brackets, respectively, are also formed on the upper side of the jacket, at the front end.

The chamber is cylindrical, terminating in front with a curved slope.

BREECH-CLOSING MECHANISM.

(Plate II.)

The breech is closed by a screw having three portions of the screw thread removed longitudinally, each one-sixth of the circumference. The interior of the howitzer, at the breech, being prepared in a similar manner, admits of the screw, when the raised portions are placed opposite the smooth surfaces in the howitzer, being pushed home and locked by the sixth of a turn.

The breech screw has hinged to it a cam lever, by means of which it is locked and unlocked; the cam portion of the lever (when the breech screw is locked) engages in a recess in the carrier ring, and so prevents any movement of the breech screw during firing. In lowering the cam lever after the breech screw is unlocked, the cam, acting upon the surface of the carrier ring, starts the first movement to the rear of the breech screw and obturator.

A "spring catch" is provided on the handle† of the breech screw for retaining the cam lever in the down position.

Encircling the rear end of the breech screw, and hinged to the breech ring, is a carrier ring which supports the screw when withdrawn.

The carrier ring is held to the howitzer, during the withdrawal of the breech screw, by means of a clip, fitted to the left side of the ring, engaging with a recess in a projection on the rear face of the breech ring.

A stop bolt, in the right side of the carrier ring, serves to prevent the breech screw being disengaged from the carrier ring when withdrawn; at the same time, the clip in the left side of the carrier ring is disengaged from the recess in the projection on the breech ring by means of a spiral spring, which forces the opposite end of the clip into a recess in the breech screw, thus securing the latter in the carrier ring. When in this position, the whole can be swung clear of the breech opening to admit of loading.

The carrier ring is retained in the loading position by a "spring latch."

If, when opening the breech, the carrier ring remains fast owing to the "clip retaining" not working properly, the latter can be pushed back by inserting the punch end of the breech mechanism wrench in the hole provided for the purpose on the left side of the breech.

DE BANGE OBTURATOR.

The obturator consists of a pad and pair of metal discs. The inner face of the breech screw is flat, and, between it and the mushroom head of the axial T vent, the pad and discs are arranged. The pad is made of asbestos, worked up with mutton suet to a proper consistency, and enclosed in a strong canvas cover; it is pressed in a hydraulic machine and reduced to shape. The pad is enclosed between two tin discs, the outer angles of which are

† Nos. 2 to 7 howitzers have short handles. All subsequent issues have longer handles, so as to allow more room for the hand of the number working the breech screw.

protected by steel rings. The howitzer is slightly coned at the seat of the obturator when pushed home, and the pad is provided with a corresponding taper to insure a good fit.

In putting the obturating pad and discs on to the axial vent, first place the front protecting disc, with its rounded side fitting the back of the mushroom head, then the pad with the side to the front which is curved to fit the front disc, the stitched side being to the rear; then the rear protecting disc, and in placing this, its flat side and bronze ring with which it is bushed should be on the opposite side to the pad.

If correctly assembled, the whole should fit together compactly.

The obturating pad should be a close fit in the coned seating in the gun when the breech is closed. In order to ascertain this, *slightly* cover the seating with grease (a mixture of oil and tallow), then close and open the breech with the pad and protecting discs in position, when the outer edge of the pad should be covered with grease from contact with the greased seating in the gun. When it is found after the above test that the pad and protecting discs do not fit closely into the seating, adjusting discs should be inserted (one at a time) behind the rear protecting disc until the breech screw works rather stiffly in locking, owing to the pad being pressed home into the seating in the gun.

The outer canvas of the obturating pad should be free from rents; small bruises likely to be removed by the pressure of firing are of no importance.

If the pad is not in good order, or there are too many adjusting discs behind the pad, stiffness in working the breech will probably result. The obturating pad should be rubbed occasionally with Russian tallow mixed with oil, or some other suitable lubricant; and the pad, with protecting discs, should be carefully handled to prevent them being indented or bruised.

The obturating pads and discs should be kept complete on the axial T vent in the howitzer, or in the boxes provided for the purpose, as there is a tendency of the pad to swell in the direction of its axis, which might cause difficulty in adjusting it on the breech screw.

For Care and Preservation of Obturating Pads, see "Regulations for Magazines, and Care of War Matériel."

Action.

When the breech screw is pushed into the howitzer, the obturator enters the chamber with perfect ease; on turning the breech screw, the obturating pad is pressed home into the coned seat in the howitzer by the travel of the screw. The bore is thus perfectly closed by a species of buffer in contact all round the circumference, while the mushroom head of the axial T vent receives the force of the gas on discharge. On firing the howitzer, the pressure acts on the mushroom head of the vent, and compresses the pad against the breech screw, causing it to expand laterally; from symmetry of form and position, this expansion must be radial to the axis and equal in every direction, and is sufficient to prevent the escape of the gas. On the pressure being removed, elasticity comes into play, and the obturator can be withdrawn from the cone by a straight pull, which can be given as soon as the screw is unlocked.

FIRING MECHANISM.

The firing mechanism is designed for "friction" firing, with T friction tubes.

It consists of a steel axial vent, passing through the centre of the breech screw, having secured to its outer end a head for the reception of the T tube. The vent is retained in the breech screw by means of a spring catch. Fitted to the outer face of the breech screw, and encircling the vent head, is an actuating collar, worked by the cam lever and link, by means of which the T tube is automatically turned into the firing position, when the cam lever is lowered.

The T tube is automatically released from the vent and turned into the position for withdrawing, when the cam lever is raised, the tube being withdrawn by hand.

A "lanyard, friction tube, field, T" is provided for firing the howitzer.

SIGHTING.

(Plate III.)

The howitzer is sighted upon both sides with crossbar sights.

The tangent sights drop into sockets, and are set vertically. The vertical bars are of steel, rectangular in section, and are graduated on the rear face to 10 degrees, reading to 10 minutes, and on the right side with a yard scale to 2,000 yards for a full charge with a muzzle velocity of 782 feet seconds. Adjustment is effected by means of the "clamp, tangent sight, D." The sights have bronze heads with clamping screws, and a steel horizontal crossbar, which slides within the head to the extent of 1 degree to the right, and 3 degrees to the left, for deflection. The bar is provided with a sliding reversible leaf, having a notch for direct laying; this leaf is provided with a pointed sight for rough laying, and cross wires for fine laying, when used reversed. The bar is graduated from 0 to 6 right, for the right side, and 6 to 0 left, for the left side. The bars are reversible, being graduated upon one edge for the right side, and on the opposite edge for the left side of the piece, and are stamped accordingly.

The foresights consist of a steel stem with horizontal half crossbar (forged solid). The bar is fitted with a sliding reversible leaf, having a point, for use with the notch of the tangent sight, for direct laying, and a notch and eye-hole for rough and fine laying, when used reversed. The sights slide into grooves prepared for their reception, in the foresight bracket, one of which is fitted, on each side of the clinometer plane, on the chase of the howitzer, and secured by means of a dovetail and fixing screw, and are retained in position by means of a spring catch. In the event of the spring of the catch becoming weak or broken, it will be replaced by a spare spring in the following manner:—To remove the catch, knock out the small rivet in the handle of the catch by means of a blunt punch, when the catch and spiral spring can be withdrawn. Insert new spring and replace the

catch, for which purpose a new rivet will be required, the necessary wire being allowed spare for this purpose. To release the sights, the catch must first be raised.

The foresights are left and right, the horizontal half crossbars being graduated from 0 to 6 right, for the right side, and 6 to 0 left, for the left side, respectively, to correspond with the graduations on the crossbars of the tangent sights.

The method of using these sights is explained in the drill.

Abbreviated headings of the necessary information required for laying the piece are stencilled on the cradle and chase of the howitzer, as shown on Plate IV., which should be strictly adhered to in renewing the lettering.

For dial sight, *see* p. 13.

TO REMOVE THE BREECH FITTINGS.

Before removing the fittings, the breech should be opened, the breech screw being swung into the loading position.

Axial T Vent, and Obturator.

Press down the lever of the catch in the breech screw, which retains the axial T vent; the vent can then be withdrawn from the front of the breech screw, and the obturating pad and discs removed from the vent.

When the obturator is attached to the breech screw, the removal of the latter from the carrier ring should be done by two persons, as care is necessary to keep the "clip, retaining carrier ring" withdrawn clear of the breech screw before drawing the latter back, to avoid damaging the obturating pad and discs. The obturator should, however, always be detached, when possible, from the breech screw, before removing the latter from the carrier ring.

When the breech is open, the breech screw is held in the carrier ring by a stop bolt on the right, and by the retaining clip of the carrier ring on the left. By withdrawing the retaining clip from the breech screw, and holding it back, the breech screw can be moved forward and the stop bolt pushed out from behind; the breech screw can then be withdrawn from the carrier ring, the retaining clip being held back until the breech screw is clear of the ring.

Carrier Ring.

The carrier ring is attached to the breech by a hinge bolt and set screw; in order to remove the hinge bolt, the set screw must be unscrewed clear of the hinge bolt, when the hinge bolt can be removed and the carrier ring withdrawn from the breech.

Clip, Retaining Carrier Ring.

The retaining clip is actuated by a spiral spring, and retained in the carrier ring by means of a set screw; on the removal of the set screw, the clip and spiral spring can be withdrawn from the ring.

Cam Lever.

Take out the keep pin of the hinge bolt, when the latter can be removed, and the cam lever withdrawn.

Link, Actuating Collar.

Unscrew the axis pin of the link, and withdraw the link.

Collar, Actuating.

Turn the actuating collar until the indicating arrow on the collar corresponds with the arrow and the word "enter," engraved on the outer face of the breech screw, when the collar can be withdrawn.

Catch, Retaining, Vent Axial.

To remove the catch, it must be pressed outwards by means of a piece of wood or a screwdriver, used as a lever in the interior of the breech screw, until the axis pin can be removed by means of a screwdriver, and the lever and catch with spiral spring withdrawn from the breech screw.

Catch, Retaining, Cam Lever.

To remove the catch retaining cam lever of a certain number of the first issue of these howitzers, it is necessary first to remove the handle of the breech screw. This is done by taking out the two fixing screws of the handle, and withdrawing the latter from the breech screw. The catch, with lever and spiral spring, can then be removed from the handle by taking out the axis pin of the lever of the catch.

In howitzers of later manufacture, the handle is altered to afford more clearance for the hand of the number working the breech; and the breech screw is modified so as to admit of the catch retaining cam lever being removed without taking off the handle of the breech screw.

Latch, Retaining Carrier Ring Open.

To remove the latch, press it down until the stop screw is at the bottom of the slot, then unscrew the stop screw and remove it, when the latch and spiral spring can be withdrawn.

TO RE-ASSEMBLE THE BREECH FITTINGS.

The converse of the above action takes place in re-assembling the fittings on the howitzer.

Care must be taken, when placing the axial T vent and obturating pad and discs in the breech screw, to see that the indicating arrows engraved on the mushroom head of the axial T vent and the front end of the breech screw correspond, as it is in that position only that the catch in the breech screw for retaining the obturator will engage with the recess for its reception in the axial T vent.

In placing the actuating collar in position in the breech screw, the indicating arrow on the collar must correspond with the arrow and the word "enter" engraved on the outer face of the breech screw. When the collar is placed in the breech screw, it must then be turned

until the indicating arrow corresponds with another arrow with the words "engage link" on the breech screw, before the link of the actuating collar is placed in position.

CARE AND PRESERVATION OF HOWITZER AND FITTINGS.

See also "*Regulations for Magazines, and Care of War Matériel.*"

(Special Instructions not in above mentioned Regulations.)

The breech fittings should be kept clean, oiled, or greased, and in good working order; all working surfaces must be well lubricated, the fittings being taken off sometimes for this purpose, especially after firing.

To lubricate the hinge bolt of the carrier ring without removing the fittings, the small screw on the top of the hinge bolt should be removed, and oil poured into the channel, taking care to replace the screw after oiling.

All fittings of the howitzer should be treated with care; violence and jerks should be avoided, and no unnecessary force should be employed.

The breech fittings should work easily, and be free from cracks and burrs; the latter can be removed by filing, but this must be done carefully, so as not to permanently damage the fittings. Should a crack be observed in a breech fitting, such fitting should be exchanged.

The threads of the breech screw should be free from burrs; should the screw not work easily, when the obturator has been detached, the defect may often be remedied by careful filing, but no portion of the thread should be cut away to remove a crack.

The breech should be kept covered by the canvas cover provided for this purpose, to prevent dust and grit getting into the interstices of the breech fittings.

RIFLES, AIMING, M.H. CHAMBER, EWART, B.L. 5-INCH HOWITZER.

This apparatus is for use with the howitzer in imparting instruction in laying, and consists of the following parts:—

Rifle, aiming, M.H. chamber, Ewart—

Band†	..	..	..	..	bronze, with securing screw, collar, and keep pin.
Barrel, rifle	..	..	..	..	M.H. rifle barrel, with breech action and metal boss.
Bracket†	..	..	..	..	bronze, with fixing screw, key, and buffer.
Cord, firing	..	..	..	..	white line, tarred, 2 yards long, with two hooks.
Link, trigger	..	..	..	..	bronze, with fixing screw.

† Special to the howitzer.

Tube, 0.23-inch J.	steel, with breech piece, bushes (movable and fixed), set nut and leather washer; rifles, aiming, M.H. chamber, Elswick and Ewart (identical with tube, aiming, M.H. rifle).
Tube, 0.23-inch—	
Brush, cleaning.	
Key, M.H.	
Rod, cleaning.	

Method of Fitting, Adjusting, and Using the Apparatus.

The aiming rifle is fitted to the upper left side of the howitzer in the following manner:—

The band is placed over the exterior of the chase of the howitzer, and secured in position by a securing screw. The bracket is fitted to the upper part of the breech ring, and secured by a fixing screw. The distance between the inner faces of the bracket and band, when in position, is 27 inches. The muzzle of the rifle is passed through the hole in the arm projecting from the band, and the breech is placed in the socket in the bracket, and fastened with a key. A buffer spring, to lessen the recoil, fits into the socket in rear of the rifle. A hole is made at the rear end of the socket to facilitate the extraction of the buffer spring.

To adjust the rifle on the howitzer, the latter is laid on a mark and the rifle placed as near as possible parallel with the vertical plane of the piece; the band and bracket will then be firmly screwed up and a trial shot taken. Should the rifle be much out of line, the band will require to be slackened and moved round the chase in the required direction, but any slight error in line will be corrected by use of the deflection scale.

Elevation is obtained by means of the howitzer sights.

The rifle is fired by means of the firing cord, which is attached at one end, by means of a hook, to the loop of the trigger link, the other end of the cord being led round the removable clamp on the tangent sight, on the left-hand side of the howitzer, to the firing number.

DESCRIPTIONS OF CARRIAGE, LIMBERS, WAGONS, &c.

Carriage, field, B.L. 5-inch howitzer, Mark I.

Sight, dial, No. 3, Marks I and II.

Limber, B.L. 5-inch howitzer, Marks I, I*, and II.

Wagon, ammunition, B.L. 5-inch howitzer, Marks I, I*, and II.

Wagon, general service, Marks IX, X, and X*.

CARRIAGE, FIELD, B.L. 5-INCH HOWITZER.

(Plates V and VI.)

The carriage consists of two side brackets, a trail eye, a cradle with hydraulic buffers and running out springs, elevating gear, shoe brakes, an axletree with 2nd-class arms, and two field wheels, and is fitted for a No. 3 dial sight.

The side brackets are of steel plate, connected by top and bottom plates, transoms, and a trail eye. Bearings are formed in the upper parts of the brackets to take the trunnion arms of the cradle. The cradle is held in position by capsquares, which are hinged at their lower ends to the side brackets and secured at their upper ends by keys. A hole is cut in the right bracket for the lanyard to pass through when firing at extreme angles of elevation.

The trail eye is of wrought iron, the eye being fitted with a movable piece of hard steel.†

The cradle is in one casting, of steel, with trunnion arms to pivot it to the carriage brackets; it has an opening in the centre, recessed at each side, in which the howitzer slides on recoil, and three cylindrical openings at each side, the centre one for a hydraulic buffer, and the upper and lower for running out springs. Each buffer consists of a steel tube, a piston with rod and controlling rod, a rear gland, and a front plug. The buffers are connected by a pipe to equalise the pressure. On the upper part of the cradle a plane is cut for the clinometer. A line of white paint is marked on the right side of the cradle (excepting those in field batteries) in such a position that when the line is opposite the bracket of the carriage, the howitzer will be in the loading position.

The hydraulic buffer tube, which is closed by the rear gland and the front plug, is formed at the rear into a stuffing box to take cotton packing. The piston rod, which is fitted with a metal ring round the periphery of the piston to prevent seizure, passes through the rear gland, and is connected to a projection on the breech ring of the howitzer. The upper and lower openings are each fitted to receive two running out springs, which are held under initial compression on a nut bolt; the rear end of each nut bolt is connected to a projection on the breech ring of the howitzer. The bore of the buffer tube is slightly tapered, so that the space around the periphery of the piston may form a varying orifice for the flow of the liquid; by this means an approximately constant pressure is maintained in the buffer throughout the stroke. The controlling rod of the piston fits into a recess formed in the front plug, so as to form a small hydraulic cushion, which prevents injury to the buffer by concussion caused by the return of the howitzer.

On firing, the piston rods, and nut bolts carrying springs, are drawn out of the cylinders, thus checking the recoil and further compressing the running out springs; the energy thus stored up in the springs returns the howitzer to the firing position. The howitzer recoils about $5\frac{1}{2}$ inches in the cradle, during which the motion is gradually imparted to the whole structure, thus lessening the strain upon it due to firing.

The cradle is fitted on each side with a bracket to receive the supporting pillar of the dial sight. The bracket is provided with a thumb-screw and a set screw with lock nut, acting on opposite sides of a lug on the sight pillar. The set screw must not be moved unless it is required to adjust the sight for alignment. Special spanners, Nos. 261 and 262, are provided for this purpose, and when not in use are carried in pockets in the sight case. Leather caps are provided to protect the pillar socket in the bracket when the pillar is removed.

The elevating gear is supported in brackets which are attached to

† In future manufacture the trail and perch eyes and limber hooks will have a piece of hard steel worked in, instead of being fitted with movable steel pieces.

the right side of the trail, and consists of a screw, handwheel with oscillating bearing and case, and a connecting lever; it is actuated by the handwheel, which transmits motion to the lever fixed to the cradle trunnion. When travelling, the handwheel is strapped to a staple on the trail. A clamping arrangement, also attached to the right side of the trail, is actuated by a lever, which moves a jamming screw and clamps the axle against the inner face of the carriage bracket, thus securing the cradle in any required position.

The brake consists of two brake or drag shoes, two drag shoe or brake shoe wire ropes, two sets of suspending chains, and two drag washers. The brake shoes (which are in one steel forging, with the sides splayed out to the front) are attached to the sides of the carriage, near the trail eye, by the wire ropes; the inner sides are connected by the suspending chains to the axletree, and, when in use, the outer sides are connected with the drag washers by ram's horn hooks.

In action, the shoes are placed on the ground, behind, and against the wheels, and the outer suspending chains are connected to the drag washers. On recoil, the wheels of the carriage run on the shoes, and ride on them during recoil. On running up, the wheels leave the shoes, which remain in position for the next recoil. When not in use, the shoes and outer chains are hung on hooks fixed to the rear of the axletree for the purpose. The brake shoe is turned over before hooking up, and the end link of the outer chain is slipped on the hook before the shoe is hooked up.

The brake shoes, which are also used as travelling drag shoes when required, are fitted with hardened steel soles, and designated "Shoe, drag, No. 8." When travelling, the shoes are hung on hooks fixed to the front of the axletree.

The axletree, which is 2nd Class C, No. 204, passes through octagonal holes in flanges which are attached to the side brackets; it is also connected to the side brackets by two tensile stays.

The wheels are 2nd Class C, No. 35A,† 5 feet in diameter, with steel nave, removable pipe box, and a 3-inch tire with rounded edges. The nave consists of two flanges of corrugated steel, which are connected by 14 bolts; the inner flange is fitted with a steel ring to strengthen it, and the outer flange with a metal centering ring; the pipe box passes through the flanges, and is secured by a nut, which is prevented from working loose by a spring fixed to the centering ring.

For removing the pipe box a spanner (No. 93) is provided (one per section, carried on the ammunition wagon).

The carriage is furnished with locking plates, and fitted to carry a leather box (containing 1 claw hammer, 1 pair of pincers, 1 McMahon spanner, 1 breech brush, 2 hydraulic buffer spanners, No. 77 and 98, and 1 spanner filling plug, No. 79); a piassaba brush; a traversing handspike, No. 1; 2 aiming posts; a No. 9 oilcan; a fuze key in pocket; 2 water buckets; a wire cutter pocket; a rimmer vent T; a bit vent, and a leather case containing a No. 3 dial sight with pillar, key and 2 spanners.

The method of packing the above stores is shown on packing diagrams A and B.

† In some cases No. 42 wheel has been issued with these carriages.

SIGHTS, DIAL, No. 3, MARKS I AND II.

(Plates VII to IX.)

The Mark II sight is constructed to indicate the quadrant elevation of the howitzer, the angle between the line of fire and any selected aiming point, and the angle of deflection; and to correct any error due to difference in level of the wheels.

The sight tube is provided with a small eye-hole at one end, and cross-wires at the other, and with fore and hind sights for rough laying. It is pivoted horizontally to a trunnion bearing which permits of the tube being moved through a vertical angle of 20 degrees. The trunnion bearing is pivoted vertically to the centre of the degree scale ring carrying plate, and is formed with an index arm to which a vernier is fixed. The bearing may be clamped to the degree scale ring carrying plate at any angle by a clamping screw.

The upper portion of the degree scale ring carrying plate is circular in form, and has a degree scale ring fixed to its periphery; the ring is marked in degrees from 0 to 180 in red on the right side, and from 0 to 179 in black on the left side; by means of the vernier on the index arm, movements of $\frac{1}{6}$ of a degree (10 minutes) may be read. The motion of the plate for elevation is centred on a transverse pivot in the crosshead.

The crosshead is pivoted longitudinally to the stem to enable the degree scale ring carrying plate being cross-levelled.

The stem is formed to fit in the steel pillar to which it is secured by an eccentric clamping handle.

The degree scale ring carrying plate is elevated by means of a nut and screw; a graduated drum is attached to the nut, and rotates with it; the amount of elevation is indicated by a fixed reader, the graduations being numbered from 0 degrees to 50 degrees, each degree being subdivided into divisions of 5 minutes. The elevating nut is specially constructed to enable the backlash, due to wear, being taken up automatically. The longitudinal level on the degree scale ring carrying plate is used in conjunction with the elevation drum to indicate the amount of quadrant elevation. The cross-level is constructed to slide transversely in a curved carrier on the degree scale ring carrying plate, and is used in conjunction with the levelling screw to correct errors due to differences in level of wheels, and to indicate small angles of deflection. There are 15 graduations right and left on the scale plate, and the values of these graduations vary with the elevation of the howitzer, as shown in the table below. In levelling the sight for unlevel wheels, the arrow must first be set at 0.

The cross and longitudinal levels are provided with reflectors, so that the position of the bubbles may be observed below the height of the levels.

The transverse axis of the sight is set at an angle of 1 degree 50 minutes, to the degree scale ring carrying plate, to compensate for drift.

A leather lifting handle is attached to the sight to facilitate its removal to and from the pillar.

A certain number of Mark I sights have been issued, which differ from the Mark II sight in the following particulars:—

No vernier is provided to obtain readings of a fraction of a degree. Elevation is obtained by means of a toothed arc and catch instead of a screw and nut, the angle being

indicated in intervals of 2 degrees on the arc, and in intervals of 5 minutes by means of a sliding longitudinal level, instead of a drum. The stem is circular instead of triangular in section, and no lifting handle is provided.

As the supporting pillar and leather case differ in pattern for each Mark of sight, they will, to ensure interchangeability of sights on any carriage, be regarded as part of the sight.

Table showing the value of one division on the cross-level scale for various elevations:—

Elevation of howitzer in degrees.	Approximate value in minutes of each division on the cross-level.
45	10
40	9
35	8
30	7
25	6
20	5
15	4
10	2½
5	1½

LIMBERS, B.L. 5-INCH HOWITZER.

(Plates X and XI.)

The Mark I limber consists of a steel frame, a limber hook, a 2nd-class axletree, a pole and pole bar, two swingletrees, an ammunition box, and two field wheels.

The frame consists of four futchels, connected by front and diagonal stays; a platform and a footboard are fitted to the top, and draught hooks for the swingletrees to the front of the outer futchels; the footboard is raised by wood blocks 7 inches above the platform board.

A wrought-iron limber hook (No. 12), with movable steel,† is riveted to the inner futchels.

The axletree (No. 98) is a weldless steel tube with 2nd-class arms; it is secured by pins to flanges, which are attached to the futchels.

The pole draught consists of a No. 17, Marks II* or III, pole, two No. 10A or 11 swingletrees, a No. 3 supporting bar (3 feet 9½ inches long), for use with breast harness.

The ammunition box, which is of wood, is fitted with guard irons and opens at the rear. The rear of the box is in two parts, hinged to the top and bottom respectively. In opening the box, the upper part is moved upwards, and the lower part downwards; and the latter, when down, serves as a shelf for fuzeing shell when required, being prevented from falling below the horizontal position by means of stop plates and stops, which are attached to it and to the sides of the box. The box is divided internally into four tiers of compartments, the three lower to carry, horizontally, 21 lyddite common shell, and the upper to carry two cartouches (for 15 and 6 cartridges respectively), two fuze boxes, No. 27 (containing fuzes and T tubes), and two wood trays (an upper and lower), marked "B"

† See footnote †, page 11.

and "A" respectively, for howitzer fittings, &c. The shell and fuze boxes are held in position by metal discs.

The wheels are 2nd Class C, No. 42 or 35A.

The limber is fitted on the "off" side, at the rear, with a box to carry a "large" clinometer, and on the "near" side with a plate to carry a No. 3 lubricating can†. Fittings are provided on the "near" side of footboard for a steel box, arranged to carry a vent and a box for obturating pads and discs.

The limbers are also fitted to carry various stores, as shown in packing diagram A.

Half the limbers per battery will be fitted with loops for kicking straps.

The Mark I* differs from Mark I in a few manufacturing details only, except that the ammunition box is similar to Mark II.

Mark II is generally similar to Mark I, but the ammunition box differs in the interior being divided into three tiers, the two lower to carry, horizontally, 16 projectiles, and the upper to carry four cartridge boxes (each containing four cartridges), two fuze boxes, No. 30 (each containing 8 fuzes and 10 T tubes), and three wooden trays, marked "A" and "B," for howitzer fittings, &c., and "C" for clinometers. The projectiles and the "C" tray are held in position by metal discs.

A board is attached by brackets to the front, and one is hinged to the rear (both flush with the top of the box), to afford seating space sufficient to carry four men when necessary. Foot rests are also provided at the rear.

The wheels are 2nd Class C, No. 42 or 35A.

The limber is fitted at the rear, on the "near" side, with a plate to carry a No. 3 lubricating can† and a 3-lb. grease box; and on the footboard, on the "near" side, for either a steel box to carry a vent, and box for obturating pads and discs, or box, lantern, bull's eye‡.

Fittings are also provided to carry various stores, as shown in packing diagram B.

Half the limbers per battery will be fitted with loops for kicking straps.

WAGON, AMMUNITION, B.L. 5-INCH HOWITZER.

(Plates XII and XIII.)

The Mark I wagon consists of a steel frame, a hollow box perch fitted with trail eye, a travelling drag shoe, an ammunition box, a 2nd-class axletree, and two field wheels.

The frame consists of two flanged sides connected by channel stays; a footboard, raised by wood blocks, is fitted to the sides and perch in the front, and on the under side, at the rear, two wood boxes are attached by bands.

The perch, which is riveted to the frame and connected by two stays, is made of steel plate; it is fitted with a perch eye (No. 7), with movable steel§, locking plates, and with a loop for the attachment of the drag shoe|| (No. 3) and chain (No. 18). The drag shoe, when not in use, is carried on the top of the perch, and secured by a leather strap.

† Carriage limber.

‡ Wagon limber.

§ See footnote †, page 11.

|| When wagons are fitted with tire brakes the drag shoe and chain will not be issued.

The ammunition box is generally similar to that described for the limber, but differs slightly in the internal arrangement. The three lower tiers are fitted for 24 lyddite common shell, and the top tier for two cartouches (each carrying 12 cartridges†), two No. 27 fuze boxes (containing fuzes and T tubes), and a wood tray for small stores.

The axletree, No. 38, is of weldless steel tube, with 2nd-class arms; it is held in flanges, which are secured to the sides and perch.

The wheels are No. 42 or 35A.

On the footboard, fittings are provided for carrying, on "near" side, a box for bull's-eye lantern.

The wagon is also fitted to carry various stores, as shown in packing diagram A.

The Mark I* differs from Mark I in a few manufacturing details only, except that it is fitted with a tire brake, and has an ammunition box similar to Mark II.

The Mark II is generally similar to Mark I, but the ammunition box is in two portions and made to open both front and rear, the upper part of the lid opening upwards and the lower part downwards, the latter when down serving as a shelf for fuzeing shell when required.

Both the front and rear portions of the box are divided internally into three tiers, the two lower to carry, horizontally, 16 projectiles, and the upper to carry four cartridge boxes (each containing four cartridges), two fuze boxes, No. 30 (each containing 8 fuzes and 10 T tubes), and a wooden tray for small stores. The projectiles and tray are held in position by metal discs.

A tire brake, having cast-iron brake blocks, is provided, which acts on the front of the wheels, and is applied from the rear by means of a handle.

The wheels are 2nd Class C, No. 42 or 35A.

The wagon is also fitted to carry various stores, as shown in packing diagram B.

Dimensions, &c.

				Carriage and Limber.		Wagon and Limber.	
				ft.	in.	ft.	in.
Height to axis of howitzer .. .. .	..	..	..	3	7	—	—
Length of {	carriage and	{ with howitzer .. .. .	..	24	1½	—	—
	limber	{ without howitzer .. .. .	..	23	6	—	—
	wagon and limber .. .. .	..	..	—	—	22	5
	axletree .. .. .	..	..	6	2	6	2
Length between axletrees .. .. .	..	..	..	8	2½	7	2½
Greatest projection beyond track of wheels .. .. .	..	..	..	0	6	0	6
Maximum width .. .. .	..	..	..	6	2	6	2
Wheels {	track .. .. .	..	..	5	2	5	2
	diameter .. .. .	..	..	5	0	5	0
Space required to turn in .. .. .	..	..	..	32	6	29	0
Angle of {	trail .. .. .	..	..	21½°	—	—	—
	lock .. .. .	..	..	50°	—	65°	—
Upsetting angle .. .. .	..	..	..	35°	—	34°	—
Elevation, maximum .. .. .	..	..	..	45°	—	—	—
Depression .. .. .	..	..	..	5°	—	—	—
Tonnage {	for shipment .. .. .	..	..	6.487 tons	—	6.65 tons	—
	for transport in boats .. .. .	..	..	12.44	—	12.27	—
Rectangular space occupied in boats .. .. .	..	..	..	15' 3" × 6' 2"	—	15' × 6' 2"	—

† These will contain 15 cartridges, if required.

Weights, &c.

(Packed, and with personal equipment, but without detachment.)

	Carriage, Mark I, and Limber, Mark I.	Wagon, Mark I, and Limber, Mark I.	Carriage, Mark I, and Limber, Mark II.	Wagon, Mark II, and Limber, Mark II.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
Carriage { without howitzer	14 1 0	—	14 1 0	—
Carriage { with howitzer	23 3 13	—	23 3 13	—
Limber { without howitzer	22 2 23	22 2 23	19 1 23	19 1 23
Limber { with howitzer	46 2 8	—	43 1 8	—
Carriage { weight on two fore wheels	24 0 8	—	—	—
and limber { " two hind "	22 2 0	—	—	—
Wagon { without limber	—	23 2 13	—	29 1 18†
Wagon { and limber	—	46 1 8	—	48 3 13†
Wagon and { weight on two fore wheels	—	24 1 16	—	10 3 10†
limber { " two hind "	—	21 3 20	—	12 1 15†
Weight at end of pole, limbers	0 1 20	0 1 27	0 1 0†	0 1 0†
Pressure of perch on ground, wagon ...	—	1 3 0	—	1 0 20
" trail carriage	2 1 0	—	—	—
Wheel, { No. 35A	1 3 10	1 3 10	1 3 10	1 3 10
Wheel, { " 42	2 0 16	2 0 16	2 0 16	2 0 16

WAGONS, G.S., MARKS IX, X, AND X*.

The Mark IX wagon consists generally of the following parts: body, under carriages, seat, floating raves, brake, axletrees and wheels. It is fitted with a 4-inch roller scotch, whip socket and two grease boxes.

The body is separate from, but rests on, front and rear under-carriages. Allowance is made on the front carriage for slight longitudinal motion, to ensure flexibility to the vehicle for rough travelling. The rear under carriage has two straight guides, which are continued slightly beyond the body.

A locker is formed on the front part of the wagon; the locker is bevelled off to allow the fore carriage to have a greater sweep, and thus minimise the space in which the wagon can turn.

The wagon is fitted for pole draught, which consists of a No. 7A pole, and two No. 3A or 10A swingletrees.

The splinter bar is strengthened by iron stays, which are formed with hooks at the front for the attachment of the swingletrees.

The driver's seat is supported on elliptical springs, to afford easy riding; the springs are fixed to a crossbar, with ends formed to fit over two wooden standards, and are kept from being too lively by two leather straps, the seat being fastened to the standards by keys.

The brake, which acts on the rear of the hind wheels, is applied from the driver's seat by a hand lever, or from the rear of the wagon by a handle operating a screw. The hand lever is connected by a flexible wire rope on the off side of the wagon to a lever secured to the guides of the rear under carriage, and fitting into a loop attached to the rear axletree bed. A brake screw is connected with this lever and a wooden crossbar, which carries the brake blocks, and which is supported by brackets secured to the end of the guides. When the hand lever is pushed forward the blocks are forced against the wheels. A rack retains the hand lever in position when the brake is applied, and a spring fixed behind the lever serves to ease the blocks off the wheels when the hand lever is released.

† Limber and wagon empty.

The cover is made of waterproof canvas, and can be adjusted to suit varying heights of loads, having on the outside two rows of tabs with eyelet holes, and on the under side and the hem side lines of white rope. Brass eyelets are secured at intervals along the hem.

The side lines of white rope on the under side are for use in reefing the cover when small loads are carried in the wagon; the four on the hem are to keep the cover clear of the wheels.

driver's seat on full and half loads.

cwt. 2 qrs.
ft.
75½ tons.
112 „
ft. 8 ins. x 6 ft. 0½ in.
x 5 ft. 3 ins.

and is fitted with a sweep bar.

rust-clipped wheels, NOS. 200A (hind), and 100A (fore).

CARE AND PRESERVATION OF CARRIAGES, &c.†

See also "*Regulations for Magazines, and Care of War Matériel.*"

(Special Instructions not in above-mentioned Regulations.)

HYDRAULIC BUFFERS.

(Plate VI.)

The full complement of liquid must be maintained in the buffer to prevent the liability of damage to the carriage when the howitzer is fired. To ensure this, always before firing is carried out, and periodically at other times, the cradle must be placed in the horizontal position, and the filling hole plugs removed to see if the oil shows at the filling holes; if not, more oil should be poured in, until it does show, and the plugs replaced.

Great care must be taken that no dust or gritty matter is poured in with the oil. If any leakage of oil takes place at the glands, or front plugs, they should be tightened; if this will not stop the leak, the packing must be renewed.

To Pack the Stuffing Box.—Fully depress the howitzer, unscrew the gland, and slip it along the piston rod; replace the defective packing with fresh material, which must be well saturated with Russian tallow before insertion, and replace the gland.

† For detailed instructions as to method of carrying out repairs, &c., see "Handbook for Military Artificers."

To Pack the Front Plug.—Empty the buffers, unscrew the plug, take out the defective packing, insert a new lead packing, replace the plug, and refill the buffers.

To Empty the Buffers.—Depress the howitzer and remove the front plugs, allowing the liquid to run into a clean can or other convenient vessel.

Total Contents, Buffers.— $2\frac{3}{4}$ pints.

To Insert New Running-out Springs.—Remove the nut bolt and tension bolt from the cradle, place the end of the nut bolt in the socket between the side brackets, unscrew the bolt, and take off the defective spring or springs. Insert a new spring or springs, placing each under an initial compression of 1.75 inches by means of the tension bolt, and replace the nut and springs in the cradle.

Replacement Limits of Running-out Springs.—The normal free length of each running-out spring is 10.5 inches. Any one spring found with a permanent set of 0.4 inch or more below the normal free length of the spring will be replaced.

INSTRUCTIONS FOR TESTING AND ADJUSTING SIGHT, DIAL, No. 3, MARK II.

(Plates VIII and IX.)

Any adjustment required must be carried out by an Armament Artificer.

Before any of the following operations are carried out, the carriage should be placed on a firm platform, or on hard level ground, and the howitzer levelled by means of a clinometer, and a straight edge, placed in the bore.

1. *The bubble of the longitudinal level should be in the centre of its run when the elevation drum is at zero.*

Test.—Set the elevation drum at zero. The bubble of the longitudinal level should be in the centre of its run.

Adjustment.—Turn the capstan-headed nuts at the ends of the longitudinal level until the bubble is in the centre of its run.

2. *The bubble of the cross-level should be in the centre of its run when the top bearing surface of the "plate, carrying degree scale ring" is horizontal, and the elevating drum and deflection scale reader arc at zero.*

Test.—Set the drum and deflection scale at zero. Place a clinometer, set at zero, on the "plate, carrying degree scale ring" at right angles to the axis of the gun, and with the cross-levelling screw raise or lower the plate until the bubble of the clinometer is in the centre of its run. The bubble of the cross-level should then be in the centre of its run.

Adjustment.—Turn the capstan-headed nuts at the ends of the cross-level until the bubble is in the centre of its run.

3. *The trunnion bearings carrying sight tube should be horizontal when the degree scale plate is horizontal.*

Test.—Set the deflection scale at zero. Bring the bubbles of the two levels central by means of the drum and cross-levelling screw. Suspend a plumb line at a distance not less than 10 yards. The cross-wires of the sighting tube

should remain on the plumb line from extreme elevation to depression of the sighting tube (without the use of the elevating drum).

Adjustment.—Adjust the sight tube trunnion bearings by scraping.

4. *The line of sight through the sighting tube should coincide with its mechanical axis, and be parallel to the line of sight through its open sights.*

Test.—Place a pair of V-blocks on a surface plate, and lay the sight tube on the V-blocks.

By means of a scribing block set the trunnions parallel to the surface plate, and make the small hole in the eye-piece the same height from the surface plate as the centre of the trunnions. The horizontal cross-wire should now be parallel with the surface plate, and the same height from it as the centre of the trunnions.

Turn the tube in the V-blocks until the trunnions are vertical to the surface plate, set by means of a square and distance pieces. The scribing block (as previously set) should now coincide with the hole in the eye-piece, the vertical cross-wire of the sight tube, and the fore and hind sights.

Adjustment.—Unscrew the two screws on front end of the tube. Carefully adjust the cross-wires; remove the bush carrying the cross-wires, and adjust. Adjust fore and hind sights by filing.

NOTE.—This test is not important, except when fitting new cross-wires or sights.

ALIGNMENT TESTS.

In order to carry out the tests for alignment, it is necessary to obtain a line of sight along the axis of the bore of the howitzer. A point at the muzzle is obtained by stretching two fine cords along the vertical and horizontal axis lines cut on the muzzle of the howitzer, their point of intersection being on the axis line. The axial vent is used as a sighting hole at the breech end.

Select a clearly-defined object, at least a mile away, to lay on, and lay the bore of the howitzer on this point.

FORE AND HIND SIGHTS.

Test.—Set all sliding leaves at 3 on the main scales, the deflection scales and the hind sights at zero; the acorn of the fore sight should be on the object when viewed through the notch of the hind sight.

Adjustment.—If considered necessary, move the deflection leaf of either sight until the sights are layed on the object; erase the arrow on the leaf, and re-mark it opposite 3 on main scale.

Test for Straightness of the Cross-bar.—Move the sliding leaves to 6 on main scales. The line of sight should still be on the object.

Adjustment.—Adjust the lower of the two bars until the line of sight is correct.

DIAL SIGHT.

Set the elevating drum on the sight, and the deflection scale reader at zero. The sight tube should be on the object.

Adjustment for Direction.—Slacken the locking nut in the dial sight bracket with the spanner No. 261 provided. With spanner No. 262 adjust the pillar in its socket by means of the adjusting screw and clamping screw, until the sight tube cross-wires are on the object. With the spanner No. 262 still in position on the adjusting screw again tighten up the locking nut by No. 261. This operation should be carried out with the sight in each of the brackets.

The clamping screw must be clamped tightly before the operation is finished.

No adjustment for elevation is necessary.

AMMUNITION.

CARTRIDGES.

CARTRIDGE, B.L. 5-INCH HOWITZER, $11\frac{7}{16}$ -OZ. CORDITE, SIZE $3\frac{3}{4}$, MARKS I TO IV.

(Plates XIV and XV.)

The Mark IV service cartridge consists of a core and three rings.

The core, with base portion, is formed of one bundle of $3\frac{1}{8}$ -oz. cordite in lengths of about 7 feet, twisted into shape.

Each ring consists of a bundle of $2\frac{9}{16}$ -oz. cordite, tied with "silk, sewing." They are secured to the core by silk or shalloon braid.

The base only is enclosed in shalloon, the core portion and the three rings being uncovered.

The cartridge has an igniter consisting of 2 drams of guncotton yarn at the base.

Marks I, II, and III differ from Mark IV in the core and base portion being formed of separate bundles of cordite, in the rings and core being covered with shalloon, and in other minor details. Marks I and II further differ from Mark IV in having an 8 drams powder igniter.

DIMENSIONS OF MARK IV CARTRIDGE.

	Over Cartridge.	Over Cover.
Length (not to exceed) ..	2.8 ins.	3.2 ins.
Diameter (not to exceed) ..	3.4 ins.	3.6 ins.

NOTES.—For use with *star shell* the charge will be $6\frac{5}{8}$ oz., core ($3\frac{1}{8}$ oz.) and one ring ($2\frac{9}{16}$ oz.).

The *drill cartridge* is to be retained for instructional purposes only.

CARTRIDGE, B.L., 4-INCH, 5-INCH GUN OR HOWITZER, AND 60-PR., 3-LB. BLANK.

The cartridge is made of No. 1 class silk cloth, and sewn with two rows of "silk, sewing"; the bottom is made circular in form, and secured to the lower end of the cartridge with "silk, sewing"; 4 silk braids are threaded round the cartridge, each braid having a loop formed at one end for the purpose of tightening up and making a firm cartridge.

The cartridge is filled with 3 lbs. of blank L.G., R.L.G., or R.L.G.² powder, choked at the top, and secured with silk twist.

COVERS, CARTRIDGE.

A silk cloth cover is provided for use with the Mark IV cartridge. A silk braid is threaded around the mouth for closing, and a becket of silk braid is stitched to the base for lifting.

With Marks I to III cartridges a dowlas cover is used.

PROJECTILES.

(Plates XVI to XX.)

Nature.	Diameter.		Length.	Bursting Charge.		Weight, filled and fuze.
	Body.	Band.		Nature.	Weight.	
Shells.	common, Marks II, III, and IV	4.97	5.115	18.2	Lyddite	9 15
	Lyddite, Mark I	4.97	5.115	15.187	"	4 14
	common, iron, Marks I to III	4.97	5.115	15.125 (about).	L.G. powder	2 12
	shrapnel, Mark VII	4.97	5.115	13.15	R.F.G. ²	0 5 1/2
	star, Mark III	4.97	5.115	15.125	R.F.G. ²	2
	Shot, case, Mark II	4.97	5.115	14.9	—	—
						50 0
						50 10
						50 0
						50 0
						29 7 1/2
						50 0

COMMON LYDDITE SHELL, MARKS I TO IV.

(Plate XVI.)

The *Mark IV* common lyddite shell is made of forged steel, to the form and dimensions shown on Plate XVI.

It is fitted with a copper driving band, the groove for the band being provided with waved ribs having three chisel cuts made across them.

The head is fitted with a metal fuze socket, which is screwed to the G.S. fuze-hole gauge.

The interior of the shell is varnished.

The bursting charge consists of lyddite, with an exploder of 4 1/2 oz. dry mixed picric powder, without primer, in a bag, enclosed in a waterproof paper cylinder 14.35 inches long.

Mark III differs from *Mark IV* in having a different form of driving band, and in the groove for the band not being provided with waved ribs.

Mark II is similar to *Mark III*, but the groove for the driving band is not undercut.

† The *Mark VII* lyddite shell for B.L. 5-inch gun may be used in the howitzer, if howitzer shell are not available. See paragraph 10148, List of Changes in War Matériel.

Mark I differs from *Mark II* in being about 3 inches shorter, and in the walls of the shell being thicker, therefore having a much smaller bursting charge.

With shells fitted with Marks I* or II special fuze-hole plugs, kit plaisters will not be used.

COMMON IRON SHELL, MARKS I TO III.

(Plate XVII.)

These shells are intended for practice and drill.

The *Mark III* common iron shell is made to the form and dimensions shown on Plate XVII.

It is fitted with a copper driving band, the groove for the band being provided with waved ribs having three chisel cuts made across them.

The head is fitted with a metal fuze socket which is screwed to the G.S. fuze-hole gauge.

The bursting charge consists of L.G. powder.

Mark II differs from *Mark III* in having a different form of driving band, and in the groove for the band not being provided with waved ribs.

Mark I is similar to *Mark II*, but the groove for the driving band is not undercut.

SHRAPNEL SHELL, MARK VII.

(Plate XVIII.)

These shells are supplied for service when specially authorised, and for practice.

The body of the shrapnel shell is made of forged steel, and fitted with a copper driving band, the groove for the band being provided with waved ribs having three chisel cuts made across them.

The shell has a recess in the base for a bursting charge of $5\frac{1}{2}$ oz. of R.F.G.² powder, contained in a tin cup.

The head is of steel, fitted with a wood block resting on a felt washer, and is attached to the body by means of screws and twisting pins. It has a metal fuze socket screwed to the G.S. fuze-hole gauge. The bottom of the fuze socket is also screwed to receive a "primer, shrapnel shell."

The body of the shell is lined with brown paper, and contains about 625 bullets (35 per lb.), which are supported in the shell by means of a steel disc resting on a shoulder formed above the bursting chamber. The interstices between the bullets are filled with resin.

A central tube is fitted through the shell to convey the flash from the fuze and shrapnel shell primer to the bursting charge in the base.

STAR SHELL, MARKS I TO III.

(Plate XIX.)

These shells are supplied when specially ordered only.

The body of the *Mark I* shell is made of steel, and has a recess in the base for the reception of a bursting charge of 2 drams of R.F.G.² powder, which is contained in a shalloon bag, and is threaded with quick match.

The head of the shell is fitted with a gunmetal fuze socket, screwed to the general service fuze-hole gauge, and is attached to the body by six brass screws and six steel twisting screws. A wrought-iron central tube, pierced with fire holes (to admit the flash to the priming of the stars) is screwed into the fuze socket, and into a disc of iron at the base of the shell.

A copper driving band is fitted into a groove near the base.

The shell contains eight stars in two tiers, four in a tier, wood supports being placed between the stars to prevent them from being crushed.

Mark II shell differs from Mark I only in the grooves for the driving band being undercut.

Mark III shell differs from the previous pattern in having a different form of driving band, and in the groove for the band being provided with waved ribs having three chisel cuts made across them.

CASE SHOT, MARK II.

(Plate XX.)

These shot are supplied when specially ordered only.

The body is made of tin, in three pieces, lap jointed and soldered. The base is made of iron, and is fitted with a copper driving band, and a bent handle; the upper portion of the base is recessed to receive the driving band. The body has an inside lining of three iron segments, and contains about 185—2-oz. sand shot, the interstices being filled with a mixture of equal quantities of clay and sand. A disc of iron or mild steel rests on top of the base inside the lining. The top is closed by a disc of iron or mild steel, which is secured by the upper edge of the body being spun over and soldered to it.

The base is secured to the body by the bottom of the latter being pressed into the recess for and being held by the driving band.

FOR INSTRUCTIONS RESPECTING THE PREPARATION, &c., OF PROJECTILES,

See "Regulations for Magazines, and Care of War Matériel."

FUZES.

(Plates XXI to XXIV.)

Percussion, Direct Action, with Cap, No. 1	}	With lyddite shell for service.
		With common shell for practice.
Percussion, Direct Action, Impact, No. 13	}	With lyddite shell for practice, except over land ranges.
Time and Percussion, Middle, No. 54	}	For shrapnel shell.
Time and Percussion, No. 62		
Time, 15 seconds, No. 25		For star shell.

FUZE, PERCUSSION, DIRECT ACTION, WITH CAP, NO. 1, MARKS I*, I**, II AND III.

(Plate XXI.)

Mark II.—This fuze is intended to act on direct impact; it cannot be depended on to act on graze unless fired at angles of elevation of 10° and upwards.

It is made of gunmetal, turned all over, and screwed below the head to fit G.S. fuze hole. The interior is bored out at the lower end for the powder charge and closed with a screw base plug. A recess in the upper part of the fuze is charged with detonating composition, and the holes communicating with the magazine are filled with powder priming. The fuze is fitted with a steel needle, passing through and secured in a copper suspending disc, .032 inch thick. The lower part of the fuze is filled with pistol or R.F.G.² powder. A gunmetal cap, having a T-shaped slot cut out in each side to fit over the projecting pins in the head of the fuze, is secured over the top.

On striking any object the suspending disc is driven in and the needle is forced against the detonating composition, thereby exploding the fuze.

Mark III differs from Mark II in having a removable detonator, a single-pointed needle, and a slightly smaller magazine, containing 65 grains of powder.

Marks I* and I** fuzes may also be used.

Weight 7 $\frac{3}{4}$ oz.

These fuzes are issued—1 in a tin cylinder, for this equipment.

FUZE, PERCUSSION, DIRECT ACTION, IMPACT, NO. 13, MARKS I** TO IV.

This fuze is for use with lyddite shell. It fits in the nose of the shell; the body is of gunmetal, 2.2 inches long, screwed externally to G.S. gauge, the upper part being turned and furnished with a small projection on each side to engage the cap. The cap has a T-shaped cut in each side of its rim to lock on the projections on the body, where it is further secured by a safety pin. There is a square keyhole in the top of the cap to take the fuze key for screwing the fuze into the shell.

The fuze requires no preparation beyond removing the safety pin and cap at the moment of loading.

Mark IV is the latest Mark of this fuze; the earlier Marks, I**, II*, and III*, have been altered to conform with Mark IV.

Weight { of fuze, 10 oz.
 { of cap, 3 oz.

FUZE, TIME AND PERCUSSION, MIDDLE, NO. 54, MARK III.

(Plate XXII.)

Mark III.—The body is hollow, and has a stem on its upper side. Round the base of the stem an annular groove is cut, from which a hole is bored to the side of the body for the gas to escape through. The sides of the body are pierced with three fire holes; the top of the body is screwed to receive a hexagonal cap. Between the cap and the dome fits a brass washer with feathers fitting into slots on the

stem of the body; it is to prevent the dome from turning with the nut and altering the setting of the fuze when the cap is screwed tight.

The *percussion pellet* has a slot in the side for the safety pellet, and brass ball, to fall into, when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in flight. The percussion pellet contains a charge of F.G. powder, and the needle plug which is screwed in; the latter is perforated with six fire holes and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet to prevent the latter turning in flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet, and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball and is suspended in the body by a thin copper wire passing through it. A hole is also bored in the upper part of the pellet and body of fuze for the safety pin to pass through.

The *base plug* has a conical hole bored in it, and is closed at the bottom by a shalloon disc and brass washer spun in; it contains a perforated pellet of pressed powder, secured by a brass washer spun over on top. The plug is fixed by stabbing in three places.

The *composition ring* has an annular groove round it for the composition; a projection on the upper side contains the hammer with steel needle, suspended by a .022-inch wire, and a detonator under it for lighting the composition in the ring. The hammer is also secured by a safety pin passing under it, the hole in the ring left by its withdrawal being closed by a brass pellet with a spiral spring above it. The ring is barrel shaped outside to facilitate the setting of the fuze, and is kept in position by three projections on the side, which fit closely round the stem of the body. Two holes are bored through the top of the ring at the commencement of the composition and covered with paper. It is graduated from 0 to 30, and reads as quarter units, and has an arrow head between the last graduation and the commencement to show the position of safety.

The body has an arrow head or black triangular mark on it for setting the fuze, opposite which is a hole from the surface to the percussion arrangement, filled with powder, for communicating the flash when the composition has burnt to it.

A small hole is made in the side to receive the pin in the semi-circular arm of the universal fuze key when screwing the fuze into the shell.

The fuze is stamped **T** on the ring close to the "time" safety pin, and **P** on the body close to the "percussion" pin to distinguish them. The time safety pin has a scarlet loop. If the fuze is required to act as a percussion fuze only, the **P** pin should be withdrawn, if as a time fuze only, the **T** pin, and if as a time and percussion fuze, both pins.

To set the time arrangement of the fuze, the nut is loosened with the "key, fuze, universal," and the ring moved round till the required graduation is opposite the arrow or black triangular mark on the body; the nut is then tightened, great care being taken to see that it is screwed down as tightly as possible.

The time of burning of the fuze at rest, when set at 30, or full length, is 16 seconds.

Action.—On discharge, if the "time" safety pin has been withdrawn, the hammer sets back, shearing the suspending wire, and fires the detonator, which lights the end of the ring of composition; this burns until the channel communicating with the lower part of the fuze is reached, when the flash passes down it and fires the detonator and magazine in the percussion arrangement.

If the "percussion" pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug into the shell.

Weight 1 lb. 4 oz.

No. 54 fuze will be superseded by No. 62 when existing stock is used up.

FUZE, TIME AND PERCUSSION, NO. 62, MARKS I AND II.

(Plate XXIII.)

The *Mark II* fuze principally consists of the following parts, which are made of gunmetal, except where otherwise stated: Body, detonator plug with detonator, percussion pellet with needle plug and steel needle, brass safety pellet, brass ball, base plug, time composition rings (upper and lower), brass springs, dome, brass washer, cap, two safety pins, and leather washer.

The *body* is screwed at the lower end to G.S. fuze-hole gauge, and bored from the bottom to receive the percussion pellet and base plug. Two holes are bored beyond the recess for the percussion pellet, one for the detonator plug, the other for the safety pellet. The hole bored for the detonator plug is continued horizontally to form a small magazine, which is filled with fine grain powder; the hole then leads upwards to join the time rings, and contains perforated pellet powder. The *stem* of the body is fitted with two studs to engage corresponding slots in the upper ring to prevent it revolving, and is screwed to take the cap, two featherways being cut in top end of stem to receive corresponding feathers on the brass washer over dome. A small tablet of fine white paper is secured with shellac to the body of the fuze over the perforated powder pellet, and over this tablet are two washers, one of fine white paper, and the other of calf skin, which are secured with shellac, a hole being cut through the washers and tablet immediately over the powder pellet; similar tablet, pellet, and washers, exist on top of the lower time ring.

The *detonator plug* is screwed on the outside to fit the hole prepared for it, and contains a detonator, which consists of a copper cap with fire holes filled with $3\frac{1}{2}$ grains of detonating composition with a .005-inch brass disc under the composition and a tinfoil disc over it, to prevent the composition working through the holes.

The *percussion pellet* has a slot in the side for the safety pellet and brass ball to fall into, when set in action. For additional safety, a hole is made transversely through the percussion pellet, and fitted with a brass retaining or centrifugal bolt, which engages in the body, and is held in position by a brass spiral spring; the outer end being the heavier part of the bolt, it disengages itself from the body in

flight. The percussion pellet contains $5\frac{1}{2}$ grains of perforated pellet powder, having under the latter a muslin disc and brass washer, and over it one grain of fine grain powder, and then the needle plug, which is screwed in; the latter is perforated with six fire holes, and contains the steel needle. A small set screw in the body fits into a slot in the percussion pellet, to prevent the latter turning in flight. Two spiral springs prevent the percussion pellet creeping forward during flight and causing premature explosion; these springs have a seating in a shallow recess in top of the pellet, and the opposite end in a corresponding recess in the fuze body.

The *safety pellet* has a slot cut in the side to clear the brass ball, and is suspended in the body by a thin copper wire which passes through it. A hole is also bored in the body and upper part of pellet for the percussion safety pin; the hole in the body left by the removal of the safety pin is closed by a brass pellet having above it a spiral spring in compression.

The *base plug* contains perforated pellet powder; over the latter are two discs, one paper, the other muslin, and a brass washer, and under the pellet a shalloon disc and a brass washer. The base of the fuze is closed by the plug, which is made secure by being stabbed in three places.

The *composition rings* have each a channel, which is lined with asbestos paper, for the fuze composition, and a hole is provided which allows the gas direct escape outside; this escape hole is lightly closed by means of a brass disc covered without by Pettman cement.

The upper ring has a chamber which contains a hammer with steel needle; the hammer is suspended by a .022-inch copper wire, a safety pin also passes through the ring and under the hammer; the hole in the ring left by the withdrawal of the pin is closed by a pellet of brass as mentioned above for the percussion safety pin (*see Safety Pellet*). Under the needle is detonating composition and mealed powder. The composition channel on the underside and the chamber are connected by a lighting hole, the composition being roughened at the lighting point to assist ignition. The outside of the ring is graduated from 0 to 60, each division being subdivided into halves and quarters, with an arrow point on bridge portion to mark the position of safety, *i.e.*, when the arrow and pointer are in the same vertical plane. The interior of the ring has two slots which engage studs on the stem to prevent the ring revolving.

The lower ring has a composition channel similar to the upper ring. The outside of the ring is barrel-shaped and milled to facilitate setting, and fitted with a setting pointer of cupro-nickel.

The *dome*, *brass washer*, and *hexagonal cap* are put on the fuze in the order here given.

The dome is of sheet brass, stamped into shape, and covers the time lighting arrangement.

The washer has two feathers, which engage in featherways cut in the stem of fuze; its object is to prevent the dome from turning and altering the setting of the fuze through friction when screwing down the cap.

The cap must be clamped tightly; this is most important: if not done, the composition may explode instead of burning. Care must also be taken when clamping not to alter the setting.

The fuze is stamped **T** on the upper composition ring close to the time safety pin, and **P** on the body close to the percussion safety pin. The pins are each provided with a whipcord becket or loop, the **T** one being scarlet, and that of **P** tarred.

The openings in the fuze are coated with Pettman cement, to exclude damp.

A leather washer in a groove above the fuze-hole thread makes a tight joint.

The fuze should be set *before* the safety pins are withdrawn.

To set the time arrangement, the cap is loosened with the "Key, fuze, universal," and the ring moved round until the graduation ordered and the pointer coincide; the fuze is then clamped by screwing down the cap as tightly as possible, care being taken that the ring and dome have even bearings, and the setting has not shifted.

If the fuze is required to act as a percussion fuze only, the **P** pin should be withdrawn and the **T** pin left in position; otherwise, both pins should be withdrawn, but this should not be done till the moment of loading.

Action.—On discharge, if the "time" safety pin has been withdrawn, the hammer sets back, shearing the suspending wire and igniting the detonator and the composition in the upper time ring, which burns until it reaches the position indicated by the setting pointer; the flash then passes through a hole in the lower ring to the composition in its under surface, and burns back in the opposite direction until it reaches a hole in the body (which is directly under the zero point of the upper ring), where it flashes down through the radial magazine, percussion detonator and pellet, and base plug, into the shell.

If the "percussion" pin has been withdrawn, the safety pellet sets back, shearing the suspending wire, and the brass ball falls down into the space over the safety pellet. The centrifugal bolt, owing to the rotation of the shell, is withdrawn, the percussion pellet is free to move forward on impact and ignite the detonator, which flashes through the percussion pellet and base plug into the shell.

The time of burning, at rest, is about 35 seconds.

Weight of Mark II fuze (about) 1 lb. 9½ oz.

Mark I fuze differs from the Mark II principally in the following particulars:—

1. The dome is thinner.
2. The stem of the body is thinner and slightly shorter.
3. It has two setting pointers, one of which is fixed to the lower time ring, and the other to the body under the rings.
4. The upper time ring is barrel-shaped on the outside to facilitate setting, and is graduated from 0 to 30.
5. The lower time ring is flat on the outside, and graduated from 30 to 60.
6. The fuze is slightly lighter, the average weight being 1 lb. 7 oz.

FUZE, TIME, 15 SECONDS, No. 25, MARKS I AND II.

(Plate XXIV.)

The *Mark II* fuze is made of aluminium, and consists of the following principal parts, viz.:—Body, time ring, cap, safety pin, detonator pellet with detonator, stirrup spring, needle plug, magazine, bottom plug, and leather washer.

The lower portion of the *body* contains the magazine, and the upper portion forms a stem, and contains the detonator pellet with

detonator and the needle plug. The shoulder of the body has a black mark to coincide with an arrow on the time ring, when set at safety.

The *time ring*, which is graduated from 0 to 44, is fitted round the exterior of the stem.

The *cap* fits over the time ring, on top of a steel spring washer, and closes the head of the fuze; it is secured when in position by a steel keep screw.

A *safety pin*, provided with a loop of red cord, passes through the detonator pellet and the cap.

The *detonator pellet* is suspended by the safety pin and a stirrup spring, which is kept in position by its two clips.

The *magazine* contains 45 grains of R.F.G.² powder, and is closed by means of the bottom plug.

Action.—On shock of discharge, the detonator pellet sets back, thereby straightening the clips of the stirrup spring, and, being driven on to the needle of the needle plug, ignites the detonator, which fires the composition of the time ring, this burning till it reaches the magazine channel, thereby igniting the powder in the magazine.

Approximate weight 5½ oz.

Mark I fuzes differ from Mark II as follows:—

1. The underside of the time ring is flat (instead of being provided with a lip and recess).
2. The magazine channel is placed at a different angle.
3. The aperture in the bottom plug is smaller.
4. The external contour of the fuze is slightly different.

FUZES, DRILL, { Percussion, D.A., with Cap, No. 1.
Time and Percussion, Middle, No. 54.
Time and Percussion, No. 62.

The drill fuzes resemble, generally, the service fuzes which they represent, and in some cases burnt-out service time and percussion fuzes are used for this purpose.

To facilitate identification, the drill fuzes are stamped "DRILL," and bronzed.

KEY, FIXING AND SETTING FUZE, TIME, No. 25.

The key is made of steel. One end is annular in shape, and provided with a projection to fit the slot in the fuze body, when fixing the fuze in the shell. The other end of the key is shaped to fit the hole in the time ring of the fuze to facilitate setting.

TUBES.

TUBES, FRICTION, T, MARKS I TO IV*.

(Plate XXV.)

Mark IV.—The form and general dimensions of the tube are shown on Plate XXV. It consists of the following principal parts:—Body, head, copper ball, plug, and friction wire.

The head is of gunmetal, the body of solid drawn brass, the ball

of soft copper, and the friction bar of half round copper wire, twisted into a round bar, with a loop at one end and the other roughened. A hole in the side of the head of the tube over the friction wire is charged with about 2 grains of detonating composition, in the form of a paste, laid over the roughened part of the friction wire, the hole being closed with a screwed brass plug. The body is charged with 8 grains of pistol powder, and is closed with a cork plug, covered with shellac cement, and a paper disc. The end of the body is burred to secure the cork plug.

A brass pin is inserted to prevent the body becoming unscrewed. The upper part of the body has a central perforation, which is enlarged in its lower part into a conical recess. The copper ball is placed in this recess, and is retained therein by a screwed plug, pierced by three fire holes.

On the withdrawal of the friction bar the detonating composition is ignited, and the flash, passing down the perforation in the head and through the plug, fires the powder charge. The ball is driven upwards by the explosion and seals the tube. This, together with the mode in which the tube is held in the special vent employed with it, prevents the escape of gas.

The body is lacquered inside and outside.

Mark IV* is a fired Mark IV tube fitted with a new shank (or body), and filled, and having the head re-fitted with a new friction wire. The earlier Marks of T-tubes differ only in minor details from Mark IV.

Marks I, I*, II, and II* will be used up with blank ammunition.

Total length of tubes 1.9 inches.

The tubes are issued in square tin boxes, 10 in a box. Both the top and the bottom of the box are removable, being secured by soldered bands, and the tubes are so arranged that five may be withdrawn from the top and five from the bottom.

†TUBE, FRICTION, T, FOR BLANK, MARK I.

ADAPTER.

TUBE, COPPER.

(Plate XXVI.)

The tube is made of solid drawn copper, 1.89 inches long, with a solid head. It is filled with pistol powder, and the bottom is closed by a paper disc, over which is a cork plug secured by shellac.

The nib piece is solid drawn and projects right through the tube: it is secured by solder, and has a small hole bored in it to allow the flash from the detonating composition to reach the powder in the tube.

The nib piece contains a copper friction bar, roughened, and smeared with detonating composition; the composition is damped with shellac varnish while it is being smeared on. The nib piece is flattened so as to retain the friction bar, the projecting portion of which is formed into a vertical eye, into which the hook of the lanyard fits.

The adapter consists of the head of a used T friction tube,

† Not to be used until T tubes, Marks I, I*, II, and II* are used up.

formed to receive the above-mentioned tube, and fitted with a removable stem.

For firing, a tube is inserted into the adapter and the lanyard hooked into the eye. On pulling the lanyard the friction bar is drawn out, igniting the composition and firing the tube.

The adapter can be used for several rounds, tubes being inserted, as refills, as required.

NOTES.

In the event of a tube failing to ignite a charge, care should be taken in extracting the fired tube not to stand directly in rear of the howitzer, as the gas generated will cause the tube to fly out with some violence so soon as the T head is clear of the recess in the vent.

The vent channel sometimes becomes choked with residue from the cartridge. When this occurs, the taper portion should be cleared with a "rimer, vent, T," sufficiently to allow of the insertion of a tube, which, when fired, will remove the rest of the obstruction.

A tube is not to be inserted in the vent till the breech is properly closed.

T friction tubes will, after firing, be returned to the Army Ordnance Department for transmission to Woolwich. They should not, in future, be immersed in mineral oil.

TUBE, FRICTION, T, DRILL, MARK I.

The drill tube is made of hardened steel, of the same external shape as the service tube. The head of the tube is grooved to receive a hardened steel spring, which is arranged for a pull of about 50 lb.

TUBE, FRICTION, T, DRILL, CONVERTED, MARK I.

This is a fired service T tube fitted with a steel spring clip, which is adjusted for a pull of about 55 to 60 lb.

This tube will supersede the "Tube, friction, T, drill, Mark I," when existing stock is used up.

TELEMETERS.

For information concerning Telemeters, see the "Handbook for Field Range Finding," "Regulations for Magazines, and Care of War Matériel," and "Equipment Regulations, Part I."

SECTION GUN DRILL.

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9853

FOR 5-INCH B.L. HOWITZER.

ARRANGEMENT.

THE DETACHMENT—

- To tell off.
- Detachment Rear.
- To form detachment rear in action.
- To take post from detachment rear in action.
- Mounted.
- To mount.
- To dismount.
- To move the gun with drag ropes.
- To move the gun without drag ropes.

PREPARATION FOR ACTION.

DUTIES.

SIGNALS.

ACTION.

To LOAD.

To FIRE.

MISS-FIRE.

To STAND FAST.

CASUALTIES.

To CEASE FIRING.

To LIMBER UP.

DISABLED ORDNANCE.

- To replace a damaged wheel.

AIMING POSTS.

USE OF CROSSHAIR SIGHTS.

METHOD OF DRILLING RECRUITS.

NOTE.—For uniformity of terms, the word “gun” is used instead of “howitzer” throughout the drill.

SECTION GUN DRILL.

Fire discipline is laid down in “Field Artillery Training.”

The following paragraphs give the duties of the detachments at the section commander's orders.

Single detachments should be accustomed to drill as if forming part of a section, and the instructor should always use the orders given for the section commander.

(3585)

THE DETACHMENT.

The detachment consists of 10 men. The senior non-commissioned officer is **1** and is in charge of the sub-section; the next senior is **10** and is the coverer as laid down in "Field Artillery Training."

DISMOUNTED.

The detachment fall in two deep, one pace between ranks, **1** on the right of the front rank.

TO TELL OFF.

<i>Section Commander.</i>		<i>No. 1.</i>
... Section—Tell Off.		

At the order from the section commander—1 numbers himself **1**; the right hand man of the rear rank **2**; the right hand man of the front rank **3**; the second man from the right of the rear rank **4**; his front rank man **5**; and so on.

DETACHMENT REAR.

Formed as above, 3 yards in rear of the gun wheels, **1** covering the off wheel.

TO FORM DETACHMENT REAR IN ACTION.

<i>Section Commander.</i>		<i>No. 1.</i>
.... Section—Detachment Rear.		No. Double March.

At the order from the section commander—1 doubles to his place and gives the order "*Double March.*"

*At the order from 1—*The remainder double to their places by the shortest way and halt.

TO TAKE POST FROM DETACHMENT REAR IN ACTION.

<i>Section Commander.</i>		<i>No. 1.</i>
.... Section—Take Post.		No. Double March.

*At the order from 1—*The detachment double to their places by the shortest way and halt.

MOUNTED.

Detachments are only mounted on an emergency on service.

For ceremonial parades, both for the walk and trot past, there will only be two men on each limber, both facing the front; and similarly two on each wagon body.

1 and 10 on their horses, when limbered up usually on the left of the gun and wagon leaders respectively; 2, 3, 4 and 5 on the gun limber, 4 and 5 in front; 6 and 7 on the wagon limber; 8 and 9 on the wagon body.

At the order "Attention"—The men on the carriages sit upright, holding the handstraps with their inward and the guard irons with their outward hands. When going over rough ground they should slightly raise themselves so as to avoid being jolted.

At the order "Sit at ease"—They place the outward upon the inward hand and sit well back.

6 may, on an emergency on service, ride between 4 and 5 when going into action. In this case he will mount and dismount by the front of the limber on the near side.

When first line wagons are on parade 8 and 9 will be mounted on them, 8 on the limber and 9 on the body.

TO MOUNT.

Section Commander.

No. 1.

.... Section — Detachments
Prepare to Mount—Mount.

At the order "Detachments Prepare to Mount" from the section commander—The men double to their places at the carriages; 2 and 3 take hold of the guard irons, 2 with his left hand, 3 with his right, placing their inner feet on the trail; 4, 6, 5 and 7 take hold of the guard irons, 4 and 6 with their right hands, 5 and 7 with their left, placing their inner feet on spokes of the wheels; 8 and 9 take hold of the guard irons, 8 with his right hand, 9 with his left, placing their inner feet on the perch.

At the order "Mount"—The whole spring into their places.

TO DISMOUNT.

Section Commander.

No. 1.

.... Section — Detachments
Prepare to Dismount—
Dismount.

At the order "Detachments Prepare to Dismount" from the section commander—The men on the carriages stand up, keeping their outward hands on the guard irons.

At the order "Dismount"—The whole jump off and form detachment rear.

TO MOVE THE GUN WITH DRAG ROPES.

Section Commander.

No. 1.

.... Section—With drag ropes,
Prepare to Advance.

At the order from the section commander—2 and 3 hook the drag ropes to the gun wheel washers, the two highest numbers go to the pole and the remainder man the ropes. Even numbers on the near side, odd on the off.

TO MOVE THE GUN WITHOUT DRAG ROPES.

Section Commander.

No. 1.

... Section—Without drag ropes,
Prepare to advance.

*At the order from the section commander—*2 and 3 push between the muzzle and wheels; 4 and 5 man the gun wheels; the two highest numbers go to the pole and the remainder assist.

The wagon is moved in a similar manner as soon as the gun has been placed in position, unless there are a sufficient number of men on parade to move the carriages simultaneously.

PREPARATION FOR ACTION.

Section Commander.

No. 1.

... Section—Prepare for Action.

At the order from the section commander—

1 sees that the bore is clear, superintends the other men, provides himself with a piece of chalk and mounts when his sub-section is ready.

2 fills the tube pocket, sees that the lanyards and aiming posts are in their places, and examines the brake.

3 removes the breech and muzzle covers and straps them to the top transom of the carriage, examines the breech fittings and brake.

4 examines the sights elevating and jamming gears.

5 sees that the fuze keys are in the pockets and examines the limber box.

6, 7, 8 and 9 see that the fuze keys are in their pockets and examine the wagon boxes.

The lanyards of all keys should be attached to the leather loop inside their pockets.

The men detailed to examine the various ammunition boxes see that they are properly filled, that the lids open easily, and that the locks are in good order. Any deficiencies in the firing battery are filled up from the 1st line of wagons under the direction of 1.

Each man resumes his place as soon as he has completed his duties.

DUTIES.

1 commands, attends to the handspike, rams home, lifts at the handspike in running up or back, and traverses. He chalks each deflection for his gun, as it is ordered, on the trail, and occasionally examines the fuzes.

He is responsible for the entire service of his gun. He only gives the words of command shown for him, he does not repeat the section commander's orders. His executive orders should be no louder than is necessary for his detachment to hear.

1 will pay particular attention to the following points:—

(1) That the most suitable ground available is selected for the position of the gun.

(2) That the shell is properly rammed home, to prevent it slipping back when the gun is elevated.

(3) That the breech is properly closed.

(4) That the deflection ordered is chalked on the trail.

Should a case arise in which it is desirable that 1 should lay, he will perform the duties of 4, with the addition of "commands," 4 performing 1's duties with the above exception.

He will traverse according to the signals.

2 lays for direction if the aiming point is in rear, plants aiming posts, shifts them when required, and brings them in on the word "*In aiming posts*," attends to the brake and vent, fires, and mans the wheel.

3 attends to the cross level, and if the aiming point is on the right front, lays for direction, attends to the brake and breech, receives a round of ammunition from 6 or 7, uncaps the fuze or removes the safety pin or pins, loads, and mans the wheel. He opens and closes the breech as follows:—

To open the breech.—He takes hold of the cam lever with his right hand, releasing the lever catch with his right thumb, raises it to its full extent, draws it to him as far as it will go, using both hands, partly folds it down with the left hand until the breech screw is started, then raises it to its full extent, and at the same time throws the breech open by the loop with his right hand.

To close the breech.—With his left hand he releases the catch on the right of the breech, takes hold of the cam lever with his right hand, swings the breech screw and carrier ring round until the carrier ring touches the breech; he then grasps the lever with his left hand, keeping it raised, and with the palm of his right he pushes the breech screw home, forcing the lever from him as far as it will go, then folds it down, seeing it is secured by its catch.

4 lays for elevation, and if the aiming point is on the left front, lays for direction, attends to the jamming gear and sights.

He will bring the gun into a convenient position for loading.

He will complete the laying as soon as the gun is run up. In giving elevation he must always depress last.

5 fuzes shell, sets time fuzes, and supplies 6 and 7 with ammunition.

6 supplies 3 with ammunition, helps in running up, returns empty cartridge tins and assists 5.

7 performs the same duties as 6.

If the ground is heavy, or the fire rapid, 8 and 9 may, by order of the section commander, be brought up to the gun to assist in running up, thus relieving 6 and 7 of that part of their duties.

SIGNALS.

Nature.	By whom given.	Meaning.
Either hand raised above his head ..	1	My gun is layed.
Motion with the palm of either hand in the required direction, arm well back }	Layer	Trail right or left.
Drops his hand	Layer	Halt (traversing).

ACTION.

Section Commander.	No. 1.
.... Section—Action Front.	No.... Action Front.

At the order from 1—3 unkeys and, with 2, lifts the trail; when the trail is clear of the hook, 3 orders "Limber drive on."

2 and 3 carry the trail round half a circle to the left, 2 shifting round the trail eye to avoid walking backwards, and lower it to the ground.

4 and 5 man the wheels.

The limber moves as detailed in "Field Artillery Training."

As soon as the trail has been lowered to the ground—

1 ships the handspike, directs the gun on to the target and points out the target, if necessary, to 4. As soon as the gun (if loaded) is reported layed, he holds up his hand, and, should he see that the section commander has not observed this signal, he will call his attention by reporting "No. ... Gun 'Ready.'"

2 takes the lanyard out of the tube pocket and holds it, hook in his left hand, extractor in his right. As soon as the gun has been layed for direction he puts on the brake.

3 opens the breech, and, as soon as the gun has been layed for direction, puts on the brake.

4 fixes and adjusts the sight, and lays the gun after it is loaded; as soon as the gun is layed, removes the sight and reports "Ready."

5, assisted by 6, prepares to issue ammunition.

The position of the detachment is as follows:—

1 one yard in rear of the trail eye.

2 outside the wheel in line with the breech on the right side.

3 close to the breech on the left side.

4 in line with the trail handle on the right side.

5 in rear of the wagon.

6 and 7, alternately, in rear of the wagon.

8 and 9 remain with the first line wagons and do not come up to the firing line, unless required to replace casualties or to assist in the service of the gun.

Action Right, Left and Rear are the same except that at—

Action Right.—The trail is carried round a quarter of a circle only.

Action Left.—The trail is carried round a quarter of a circle to the right, 3 in this case shifting round the trail eye.

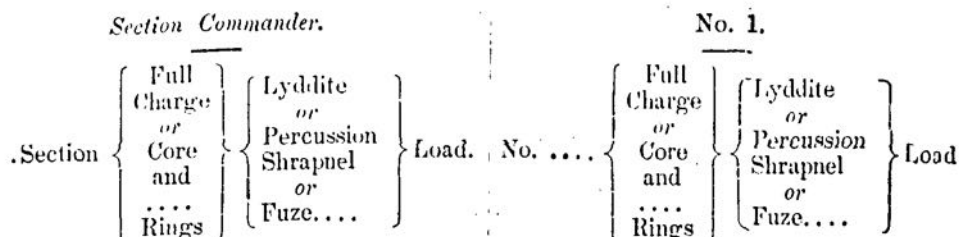
Action Rear.—The trail is not carried round.

The limber in all cases moves as detailed in "Field Artillery Training."

TO LOAD.

At drill rounds will not be loaded, but drill shells filled with sand will be placed in succession as they are used on the ground well clear on the left of the gun by the man who supplied them to 3, after 3 has gone through the

motion of loading. The end of the handspike will be placed against the base of the breech ring in the action of ramming home. Rounds will be returned to their proper place at the conclusion of the series on the order "Replace ammunition."



At the order from 1—

5 issues the ammunition ordered to 6 or 7, 6 or 7 receives the ammunition from 5, carrying the shell by the carrying strap, if used, with the base of the shell to the front, hands the shell to 3, places the cartridge tin on the ground and assists to run up, after which he returns to the wagon or limber.

Ammunition will be taken first from the rear of the wagon, then from the front of the wagon, the ammunition in the limbers being left to the last.

3 uncaps the fuze, or removes the safety pin or pins, and places the shell in the bore.

1, as soon as he sees 3 ready to load, takes the handspike in the centre with his left hand back up, takes a pace to the front with his left foot and, placing the copper shod end against the shell, rams it hard home to ensure the driving band gripping. He then steps back and places the handspike in the socket.

3 then places the cartridge in the chamber (rings to the front), closes the breech and holds up the cam lever, whilst 2 inserts a tube.

TO FIRE.

A gun is not to be fired without an order from 1, and 1 must never give this order until he has received the order from the section commander, and seen that the gun is in all respects ready.



At the order from the section commander—

1 steps clear of the recoil to the left and gives the number of his gun as a caution.

At the caution from 1—

2 hooks the lanyard to the tube (passing the lanyard between the spokes and through the hole in the bracket of the carriage should the elevation of the gun render it necessary, usually when over 30°), steps outside the wheel and stands facing the breech, holding the lanyard with his right hand.

3 and 4 step clear of recoil.

As soon as he sees 2 ready and the other men clear, 1 orders "Fire."

At the order from 1—

2 fires the gun by jerking the lanyard smartly; he then places the lanyard round his neck.

Directly the gun stops in its recoil—

4 replaces the sight in the socket and depresses the gun.
3 opens the breech.
2 takes out the old tube.
6 or 7 stand ready to man the left wheel.
The gun is then run up without further orders.

As soon as the gun is run up—

1 stands ready to traverse as directed.
2 takes the lanyard from round his neck and holds it with the hook in his left hand, extractor in his right.
4 relays for direction and brings the gun to a convenient position for loading.
6 or 7 takes back the cartridge tins when empty to 5.

MISS-FIRE.

If there is a miss-fire*, after an interval of 10 seconds, the detachment resume their positions, 2 takes out the old tube, puts in a new one, and the gun is fired when ordered.

Should miss-fires continue, the breech may be opened, but an interval of three (3) minutes must be allowed to elapse after the last miss-fire before doing so.

TO STAND FAST.

Section Commander.

No. 1.

.... Section—Stand Fast.

At the order from the section commander—

All stand fast, whatever they are doing, except that 2 unhooks the lanyard if it is hooked to the tube, and 3 places the shell in the bore if a safety pin has been withdrawn.

At the order "Go on" the work is continued.

CASUALTIES.

The captain is responsible for the replacement of casualties as directed in "Field Artillery Training."

Section commanders will order such changes of duties in their sections and detachments as they consider necessary.

* It is not a miss-fire if the wire breaks and the friction bar is not drawn.

If the full detachments cannot be maintained the reduction is made as follows:—

- (i.) With one man short, 6 performs 7's duties in addition to his own.
- (ii.) With two men short, 1 performs the duties of 2 in addition to his own.
- (iii.) With three men short, 5 performs the duties of 6 and 7; 1 performs the duties of 2 in addition to his own.

TO CEASE FIRING.

Before giving the order to cease firing, guns must be emptied.

Section Commander.

No. 1.

....Section—Cease Firing.

At the order from the section commander—

1 straps the handspike on the trail, and removes all chalk marks.

2 takes off the brake and puts the lanyard in the tube pocket.

3 takes off the brake and closes the breech.

4 replaces the sight, brings the gun into a horizontal position and clamps the jamming gear. When limbered up the gun will thus be slightly depressed at the muzzle, in which position it will always travel.

5 and 6 replace unexpended ammunition and close the ammunition box.

In no case should a fuze without a cap or safety pin be placed in a wagon or limber.

TO LIMBER UP.

Section Commander.

No. 1.

....Section—Front Limber Up.

At the order from the section commander—

The trail is lifted by 2 and 3, carried round a half circle to the right and lowered gently to the ground. 4 and 5 man the wheels. As soon as the trail has been lowered, the detachment get under cover—

1 in front of 2;

2 and 3 between breech and wheels;

4 and 5 between muzzle and wheels;

the whole with their backs to the axletree.

The limber comes up as detailed in "Field Artillery Training" and 1 orders "Halt—Limmer up."

At the order from 1—

2 and 3 lift the trail and place it on the hook, 4 and 5 man the wheels, 3 keys up, and the whole form the order of march or detachment rear as ordered.

Right, Left, and Rear Limber Up are the same except that at—

Right Limber Up—The trail is carried round a quarter of a circle only.

Left Limber Up—The trail is carried round a quarter of a circle to the left.

Rear Limber Up—The trail is not carried round.

The limber in all cases moves as detailed in "Field Artillery Training."

DISABLED ORDNANCE.

Whenever operations are not described in detail, or men are not told off to particular duties, 1 will order such duties to the several men as may be required.

Operations can thus be carried out without confusion, though no precise detail has been laid down.

TO REPLACE A DAMAGED WHEEL.

Should a gun wheel be disabled in action, it should immediately be turned so as to bring the sound portion on to the shoe and, if necessary, lashed, and notice should be sent to the captain.

The latter will immediately send up one of the spare wheels, which will be brought alongside the damaged one and the wheels changed as follows:—

<i>Section Commander.</i>	<i>No. 1.</i>
No. Change Wheels.	No. Change Wheels. Lift—Lower.

At the order "Change Wheels" from 1—

2 and 3 apply the lifting jack on the side of the damaged wheel, and lift the carriage.

1 and 6 go to the damaged wheel, 1 in rear; 6 removes the linch pin and washer.

At the order "Lift"—

The damaged wheel is taken off, 6 rolls it out of the way, and the new wheel is put on by the men who brought it up, the linch pin and washer are put on by 6.

At the order "Lower"—

2 and 3 remove the lifting jack, and all resume their duties in action.

The damaged wheel is either left on the ground, or removed by the men who brought up the new one, as the captain may have directed.

If the lifting jack is not available, the following procedure may be employed.

At the order "Change Wheels" from 1—

4 and 5 remove the pole from the wagon, and hand it to 2 or 3 (according to side).

1 and 6 go to the damaged wheel, 1 in rear; 6 removes the linch pin and washer.

2, 3, 4 and 5 man the pole, which is placed under the axletree by 2 or 3 (according to the side), 4 extra men assist to lift the carriage.

At the order "Lift"—

The axletree is lifted, the damaged wheel taken off, 6 rolling it out of the way, and the new wheel put on by the men who have brought it up.

At the order "Lower"—

The carriage is lowered, the linch pin and washer put on by 6, and the pole replaced by 4 and 5, and all resume their duties in action.

The damaged wheel is either left on the ground or removed by the men who brought up the new one, as the captain may have directed.

In removing wagon wheels the lifting jack should be used.

AIMING POSTS.

Laying by means of Aiming Posts.

The procedure is as laid down in "Field Artillery Training."

As soon as the guns are in action, 2 doubles out about 50 yards in front of the gun with his two aiming posts, kneels down and, as soon as the angle has been ordered for his gun, stands up, repeats the order (if necessary), and plants his aiming posts as directed by the gun layer. In planting the aiming posts, the one nearer the gun will be planted first.

At "Cease Firing," aiming posts are brought in by 2 on the order "In Aiming Posts."

Change of Target.

The deflection already on the sight is allowed to remain, and the angle ordered is "more" right or left.

USE OF CROSSBAR SIGHTS.

To Use the Crossbar Sight.

As a rule these sights will be used for laying for direction only, elevation being given by means of the clinometer.

For Forward Laying.

Place the notch on the sliding leaf of the tangent sight and the point on the sliding leaf of the foresight uppermost, and set both sliding leaves at the third graduation on the bar, put on the deflection ordered, by sliding the crossbar of the tangent sight to the right for right deflection or to the left for left deflection, and lay the gun on the target, aiming point, or aiming posts, by moving the trail as required.

For Reverse Laying.

Place the point on the sliding leaf of the tangent sight and the notch on the sliding leaf of the foresight uppermost, and set both sliding leaves at the third graduation on the bar, put on the deflection ordered by sliding the crossbar of the tangent sight to the right for right deflection or to the left for left deflection, and lay the gun on the aiming point or aiming posts by moving the trail as required.

METHOD OF DRILLING RECRUITS.

GENERAL REMARKS.

Many good recruits are acquainted only with the commonest English words, and, as their duties and the material they have to use are altogether new and strange, instructors should be careful—

To use the simplest language possible.

To explain, as they occur, all technical terms.

To illustrate descriptions by means of a piece of chalk or otherwise, and in all cases to render clear the object of the various duties.

Not to attempt to teach recruits elaborate descriptions, exact measurements, &c., which they do not understand.

To avoid needless repetitions, or wearying the men by keeping them for a long time at one thing; the drill should be varied by short descriptions (avoiding manufacturing details), setting fuzes, &c.

To bring men forward by successive steps, by explaining a position and then doing it; for instance, when commencing recruits' gun drill, the instructor should himself show how a duty should be performed, and then cause every man in turn to do that duty (make every man do 1's duty, then every man 2's, then 4's and so on). When each man knows the duty of each post separately, the men who work and move together should be instructed after the manner described below, before commencing gun drill in quick time.

Great patience is necessary on the part of the instructor. He must make allowance for the different capacities of the recruits, and squads should periodically be arranged so that the intelligent soldier may reap the advantage of his work, and not be kept back by those of inferior ability. Recruits, as they progress, should be called out in turn to drill, for this gives a man confidence, helps him to learn, and causes him to take an additional interest in his work.

The instructor should place himself where he can be seen and heard by all in the squad, should stand in a smart, soldierlike attitude, and should avoid pacing up and down, looking down on the ground, turning his back on the squad, and similar habits, which have the effect of fidgeting the men and distracting their attention.

His explanation should be given in a distinct voice; his word of command should be sharp and decisive.

Stress is laid on the above points, because men unconsciously imitate their instructor. A first-rate instructor will make a good detachment; his manner and style are therefore of the first importance.

The utmost alertness of attitude and smartness of movement should be enforced throughout gun drill, but while the instructor is giving detail or explanation of equipment, &c., the detachment should be allowed to stand easy.

The instructor can at any time ascertain that each number is at his post by proving. This he does by calling out "*Prove your numbers—1, 2, &c.*," when the men named will prove in succession as detailed in "*Cavalry Drill*."

If at any time the instructor wishes to change the numbers, he gives the order "*Change Rounds*." On this, 1 becomes 9; 9, 8; 8, 7; 7, 6; 6, 5; 5, 4; 4, 3; 3, 2; 2, 1.

LIST OF STORES.

CARRIAGE.

Article.	No.	Where carried.
Bit, vent, 14-inch	1	On right bracket (inside).
Box, tool, leather	1	Between side brackets.
Brush, { breech screw	1	In leather box, between brackets.
{ pisaba	1	Between side brackets.
Buckets, water, G.S., leather ..	2	On breast chain rings.
Can, lubricating, No. 9	1	Between side brackets.
Chains, suspending, { inside ..	1a	} In trail.
{ outside ..	1a	
drag shoe, { breech	1	Strapped to axletree, left side,
Covers, { breech	1	when not on howitzer.
{ muzzle, No. 4	1	On howitzer.
Driver, screw, G.S., 6-inch	1	} In leather box, between brackets.
Hammer, claw, 20-oz.	1	
Handspike, traversing, No. 1 ..	1	On top of left side bracket.
Implements, fuze, shell, and cart- ridge—		
Keys, fuze, universal	2	In pocket on left tensile stay.
Key, adjusting drum, No. 3 Mark II		
dial sight	1c	In dial sight case, in trail.
Oil, Rangoon pint	½	In lubricating can.
Pincers, carpenters' pair	1	In leather box, between brackets.
Posts, aiming	2	On left side bracket.
Pockets, { key, fuze, universal ..	1b	On left tensile stay.
{ friction tube	1b	On right tensile stay.
Rimer, vent, T	1	On right bracket (inside).
Sight, dial, No. 3	1	In leather case, in trail.
{ McMahon, 15-inch	1a	} In leather box, between brackets.
Speakers, { hydraulic buffer { No. 77	1b	
{ " 79	1b	
{ " 98	1b	
{ No. 261	1c	} In dial sight case, in trail.
{ " 262	1c	
Wrench, breech mechanism, A, with cap	1	In leather box, between brackets.

a Per section. b Issued with the carriage. c 2 per Battery.

CARRIAGE LIMBER.

Article.	Mark I.	Marks 1* & II.	Where carried.
	No.	No.	
Axes, { felling, curved helve ..	1	—	On platform board.
	—	1	On front of box.
	1	1	} Under limber.
{ pick, { heads, 4½-lb. ..	1	1	
{ helves, 36-inch, ..	1	1	
{ ferruled ..	1	1	
Bar, supporting draught pole ..	1a	1a	On footboard.
Blankets, G.S.	2	2	On top of box.
{ cartridge	—	4b	} In compartments.
{ fuze, { No. 27	2b	—	
{ " 30	—	2b	
Boxes, { grease, 3-lb.	1b	1b	Rear of axletree.
{ obturating pads and discs ..	1	1	In box on footboard "near"
side.			
{ vents, pads, and discs ..	1b	1b	On footboard, "near" side.

a Per section.

b Issued with the limber.

a 1 per section. *b* Issued with the limber.
c 10 per howitzer, carried in ammunition boxes, as convenient.
d When not in action these keys will be carried in tray B in limber box.
e When not on howitzer. *g* "A" subsection only.

Carriage Limber—continued.

Article.	Mark I.	Marks I* & II.	Where carried.
	No.	No.	
Ropes, { drag, light pair	1	1	} On footboard.
picketing, 66 feet $\frac{1}{2}$..	1a	1a	
Screw, connecting, case, screw, elevating (spare)	1g	1g	In tray A.
Shells, lyddite, common	21	16	} In limber box.
Sights, { tangent	2	2	
cross bar { fore, Mark II { right ..	1	1	} In tray A.
left ..	1	1	
Shovels, G.S.	2	—	On side of limber box.
	—	2	On front of limber box.
Springs, { catch, { cam lever (spare)	6	6	} In tray A.
	fore sight (")	6	
	vent, T, axial	6	
	(spare)	6	
	latch, carrier ring (")	6	
clip " (")	6	6	} In tray B.
carrying projectile.. ..	2	—	
Straps, { supporting, { front ..	4	4	} In compartment.
rear ..	2	2	
trace	4	4	} On footboard.
Swingletree, Nos. 10A or 11 (spare)	1	1	
Traces, saddlery pairs	2	2	} In fuze boxes.
Tubes, friction, T	30	—	
Tugs, trace	4	4	On footboard.
Vent, T, axial (spare)	1	1	In box on footboard, "near" side.
Washers, drag, 2nd class, "C" (spare)	1a	1a	Under platform board.

a 1 per section.

g "A" sub-section only.

h 4 ft. 9 in. ropes to be made up into lengths, will be issued until existing stock is exhausted.

WAGON, AMMUNITION.

Article.	Mark I.	Marks I* & II.	Where carried.
	No.	No.	
Blankets, G.S.	2	4	On top of box.
Boxes, { cartridge	—	8c	} In compartments.
	fuze { No. 27	2c	
	" 30	—	} Rear of axletree.
	grease, 14-lb.	2	
lantern, bull's eye	1	—	On footboard, "near" side.

c Issued with the wagon.

Wagon, Ammunition—continued.

Article.	Mark I.	Marks I* & II.	Where carried.
	No.	No.	
Cartouches, large	2	—	In compartment.
Cartridges, 11 $\frac{7}{8}$ -oz., cordite, size 3 $\frac{1}{4}$	24	—	In cartouches.
	—	32	In tin boxes.
Case, saw, hand	1	—	On lid of box.
Covers, cartridge	—	1	On side of box.
Fuzes, percussion, D.A., No. 1,	24	32	On cartridges.
Mark III	22	—	} In fuze boxes.
	—	32	
Handspikes, { traversing, No. 1 (spare)	1d	1d	} Under perch.
	1	1	
Implements, fuze, shell, and cart- ridge—			
Keys, fuze, universal	2a	2a	In pocket on side of box.
Keys, spring lock	1	2	On lid of boxes, in pocket.
Kettles, camp.. .. .	—	—	Under (as required).
Lashings, tarred, 1-inch, 10 feet	2c	2c	On axletree.
	3b	3b	Under perch.
Lantern, bull's eye	1	—	In box lantern.
Lines, Hambro	—	1	} In compartment.
Marline lbs.	—	1	
Pole, jointed, No. 18.. (spare)	1d	1d	Under perch.
Saw, hand, 26-inch	1	—	} In case, { lid of box.
	—	1	
Shells, lyddite, common	24	—	} In ammunition boxes.
	—	32	
Spanner, No. 93	1d	1d	On box, "off" side.
Straps, carrying projectiles ..	4	4	In compartments.
Tubes, friction, { T	30	—	} In fuze boxes.
	—	40	
Valise, horse shoe	1	1	In tray A.
Washers, axletree, { $\frac{1}{4}$ inch ..	1e	1e	On front of box.
2nd class { $\frac{1}{8}$ "	1e	1e	} In tray A.
	—	—	

a When not in action these keys will be carried in tray A.

b For each wagon carrying spare No. 18 pole.

c Issued with the wagon.

d 1 per section.

e In 6 wagons only per battery.

WAGON LIMBER.

Article.	Mark I.	Marks I* & II.	Where carried.
	No.	No.	
Axes, pick, { head, 4 $\frac{1}{2}$ -lb.	1	1	} Under limber.
	1	1	
Blankets, G.S.	2	2	On top of box.
Boxes, { cartridge	—	4	} In compartments.
	2	—	
fuze, { No. 27	—	2	} In compartments.
	—	2	
grease, 3-lb.	1f	1f	Rear of axletree.
lantern, bull's eye	—	1	On footboard, "near" side.

Wagon, Limber—continued.

Article.	Mark I.	Marks I* & II.	Where carried.
	No.	No.	
Breastpieces	2	2	On footboard.
Brushes, water, carriage	1	1	} Under limber.
Buckets, water, G.S. . . .	2	2	
Cartouche, { small	1	—	} In compartment.
{ large	1	—	
Cartridges, 11 $\frac{7}{8}$ -oz., cordite, size 3 $\frac{1}{2}$ { 21	—	16	In cartouches.
Case, large clinometer	—	1a	In tin boxes.
Chalk, white box	1	1	With clinometer.
Clinometer, large .. (spare)	—	1a	In tray A.
Cloths, sponge <i>b</i>	—	—	In tray C.
Covers, cartridge	21	16	On cartridges.
Fuzes, percussion, D.A., No. 1, { 24	—	16	} In fuze boxes.
Mark III	—	16	
Hook, bill	1	1	Under limber, "off" side.
Implements, fuze, shell, and cart- ridge—			
Keys, fuze, universal	2d	2d	} On lid of limber box, in pocket.
Keys, spring lock	1	1	
Lanyards, firing field, T, Marks II or III	2	2	In tray B.
Lantern, bull's eye	—	1	In box on footboard.
Pin, linch, 2nd class .. (spare)	1a	1a	Under platform board.
Ropes, { drag, light .. pairs	1	1	} On footboard.
{ picketing, 66 feet ..	1c	1c	
Shell, lyddite, common	21	—	} In limber box.
	—	16	
Shovels, G.S.	2	—	On side of limber box.
	—	2	On front of limber box.
Swingletree, Nos. 10A. or 11 (spare)	1	1	On footboard.
	2	—	In tray B.
Straps, { carrying projectiles ..	—	2	In compartment.
{ supporting { front ..	4	4	} On footboard.
{ rear ..	2	2	
{ trace	4	4	
Traces, saddlery pairs	2	2	
Tubes, friction, T	30	—	} In fuze boxes.
	—	20	
Tugs, trace	4	4	On footboard.
Washer, drag, 2nd class, "C" (spare)	1a	1a	Under platform board.

a 1 per section.*b* 10 per howitzer, carried in ammunition boxes as convenient.*c* On 5 wagon limbers only.*d* When not in action these keys will be carried in tray B.*e* Issued with the limber.

LIMBER,

1 drag washer, under. ||	1 pair drag ropes. 2 pairs traces, saddlery. 2 felling axe } on front of box. 2 shovels } 1 picketing rope. || 2 breastpieces. 4 straps, supporting, front.				1 litch pin, under. ||
1 vent, T axial, 3 pads and discs, } in box.	8 Cartridges in tin boxes. ¶ 5 sponge cloths.	8 Cartridges in tin boxes.	Tray "B."	1 large clinometer, 1 field clinometer, || in tray "C."	2 straps, carrying projectiles.
8 fuzes and 10 tubes in box.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.
8 fuzes and 10 tubes in box.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.

1 blanket on top.

2 water buckets, under.
† 1 key, fuzes, universal, in pocket.

1 pickaxe, under.
† 1 key, fuzes, universal, in pocket.

CONTENTS OF TRAY "A."

argent ..	..	2
are ..	..	18
arm, with bolt and pin ..	..	19
as ..	..	2
ax ..	..	2
bolt, hinge bolt, cam lever ..	..	14
tangent sight ..	..	1
cutting, T tube ..	..	1
turning collar, and pin ..	..	18
connecting, case, screw, ing ..	..	6
catch, cam lever ..	..	6
catch, vent, T axial ..	..	6
latch, carrier ring ..	..	6
clip, carrier ring ..	..	6
catch, foresight ..	..	6

CONTENTS OF TRAY "B."

Rimor, vent, T	...	...	...	1
Layards	...	...	...	2
Keys, faze, universal	...	...	...	2
Plates, preserving bracket foresight*	...	...	...	2

CARRIAGE.

[illegible]

en not on howitzer.
ction only.
" subsection only.
section.

LIMBER.

[illegible]

CONTENTS OF 'TRAY "A."

Chalk, white.

CONTENTS OF TRAY

Lanyards	...	...
Keys, fuze, universal	...	...

WAGON BODY:

1 handspike
2 lashings

1 key, lock, in po
1 lashing, 10 ft.,
1 camp kettle,

11 lashing, 10-ft., } under.
1 camp kettle,

1 valise, horse shoes.					
FRONT BOX.					
Tray.					
8 fuzes and 10 tubes in box.	8 Cartridges in tin boxes.	8 Cartridges in tin boxes.	2 Straps, carrying projectiles.		
Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.
Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.
REAR BOX.					
Tray "A."					
8 fuzes and 10 tubes in box.	8 Cartridges in tin boxes.	8 Cartridges in tin boxes.	2 Straps, carrying projectiles.		
Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.
Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.	Lyddite shell.

1 grease box, 14-lb., under.
2 blankets, on top.
1 key, lock, in case (on side).
1 hand saw, in case (on side).
1 key, lock, in pocket (on side).

1 key, lock, in pocket.

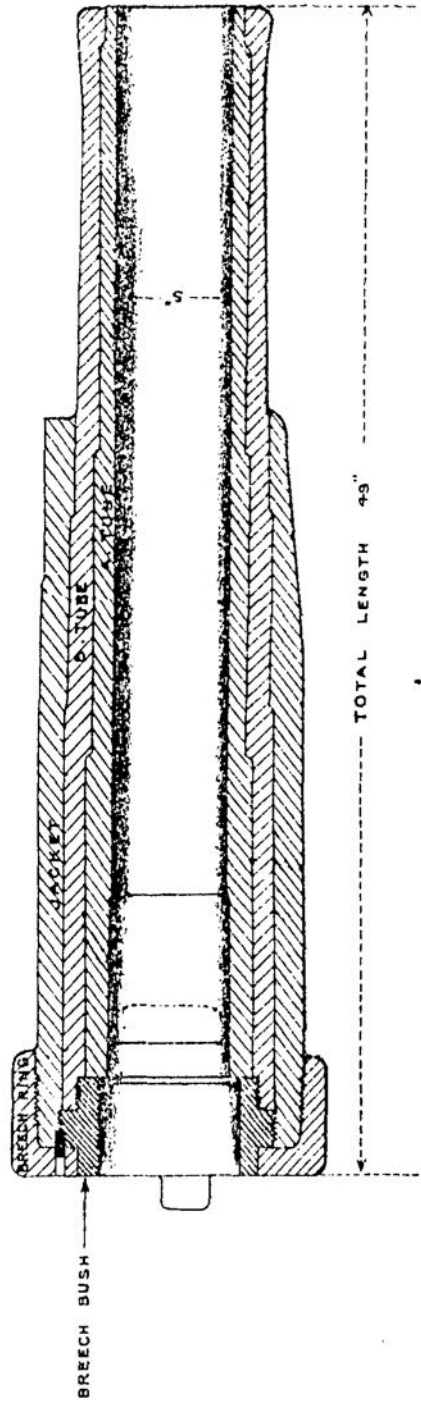
Tube T will

Para. of L. of C.	Nature of Change.	Remarks.

Para. of L. of C.	Nature of Change.	Remarks.
(3585)	Wt. 34576 3000 4/09 H & S	P. C8/209

ORDNANCE, B.L. 5-INCH, HOWITZER, MARK I.

SCALE = $\frac{1}{8}$



RIFLING

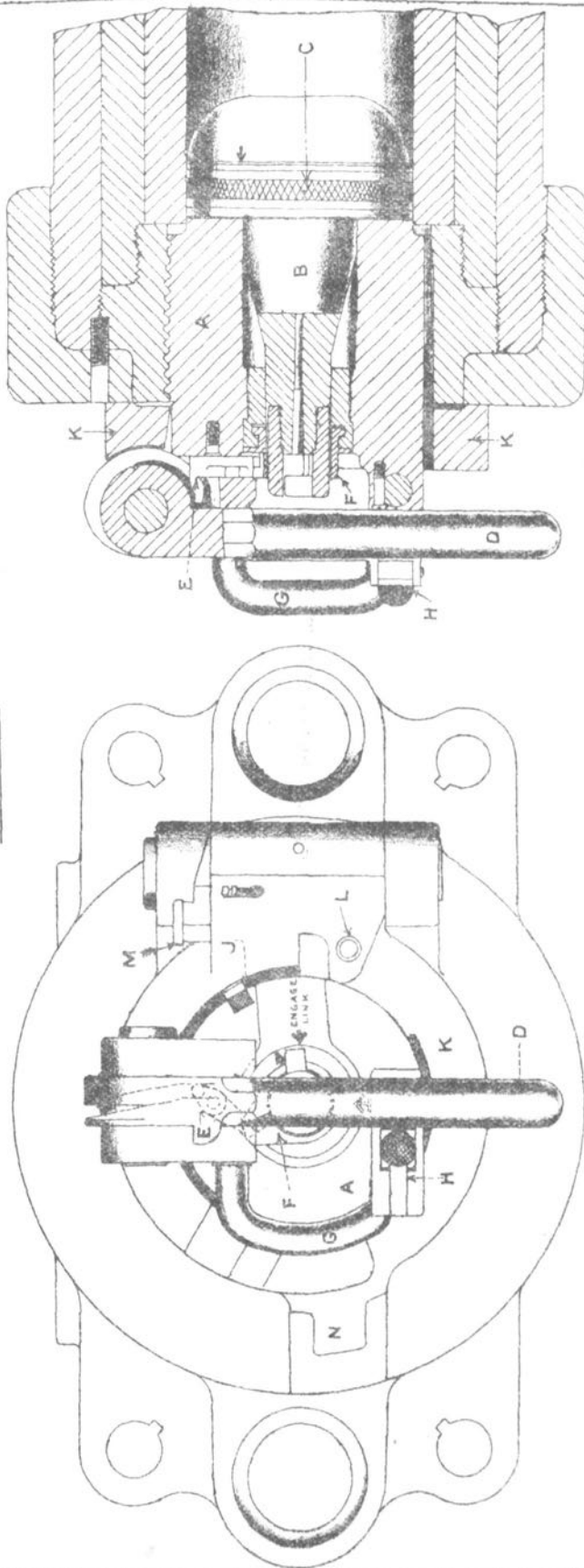
SECTION OF GROOVE
FULL SIZE

Nº OF GROOVES 20.

ORDNANCE, B.L. 5-INCH, HOWITZER MARK I

GENERAL ARRANGEMENT OF BREECH MECHANISM.

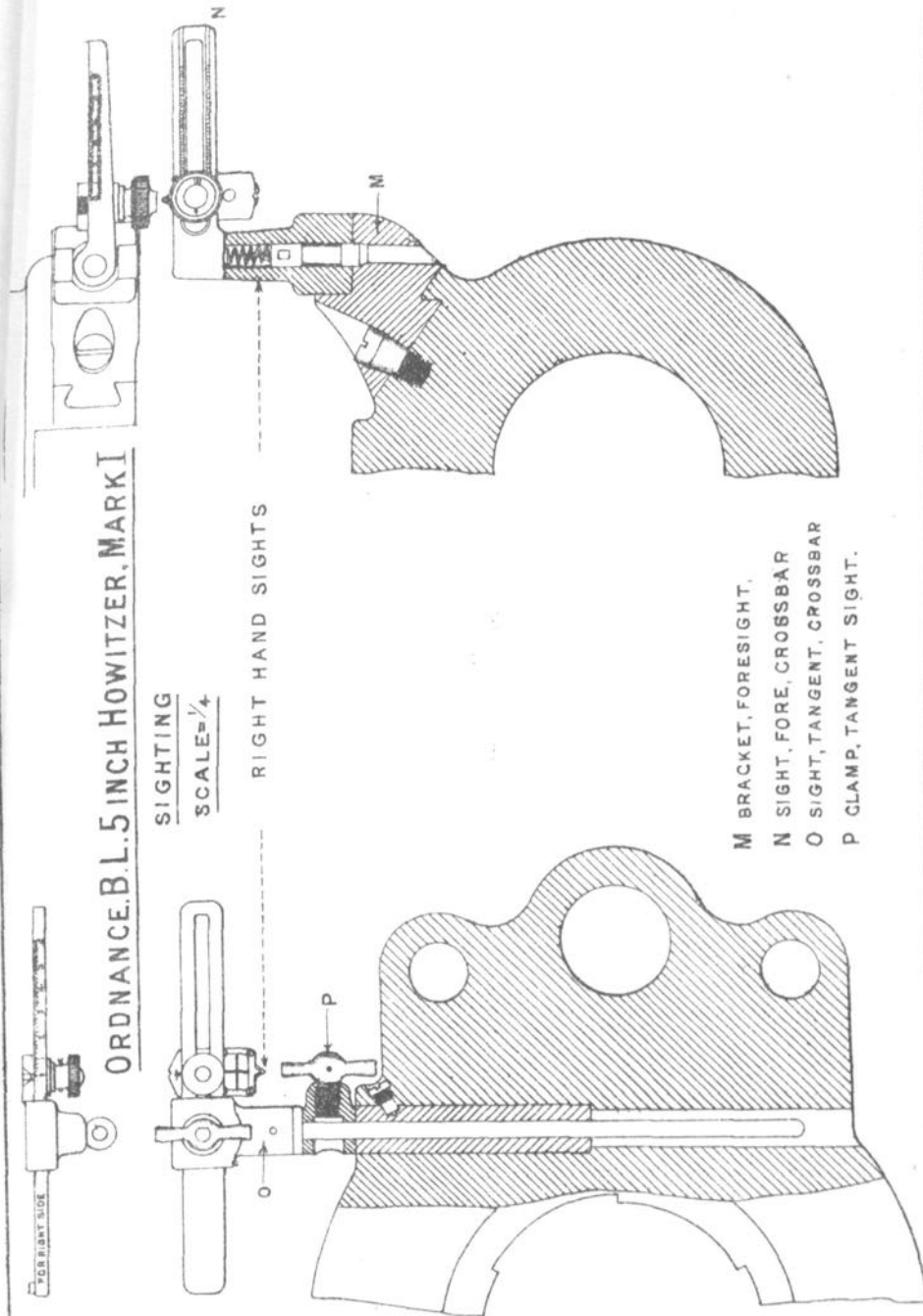
SCALE = 1/4



A. BREECH SCREW.
B. "T" AXIAL VENT.
C. PAD OBTURATOR
D. CAM LEVER

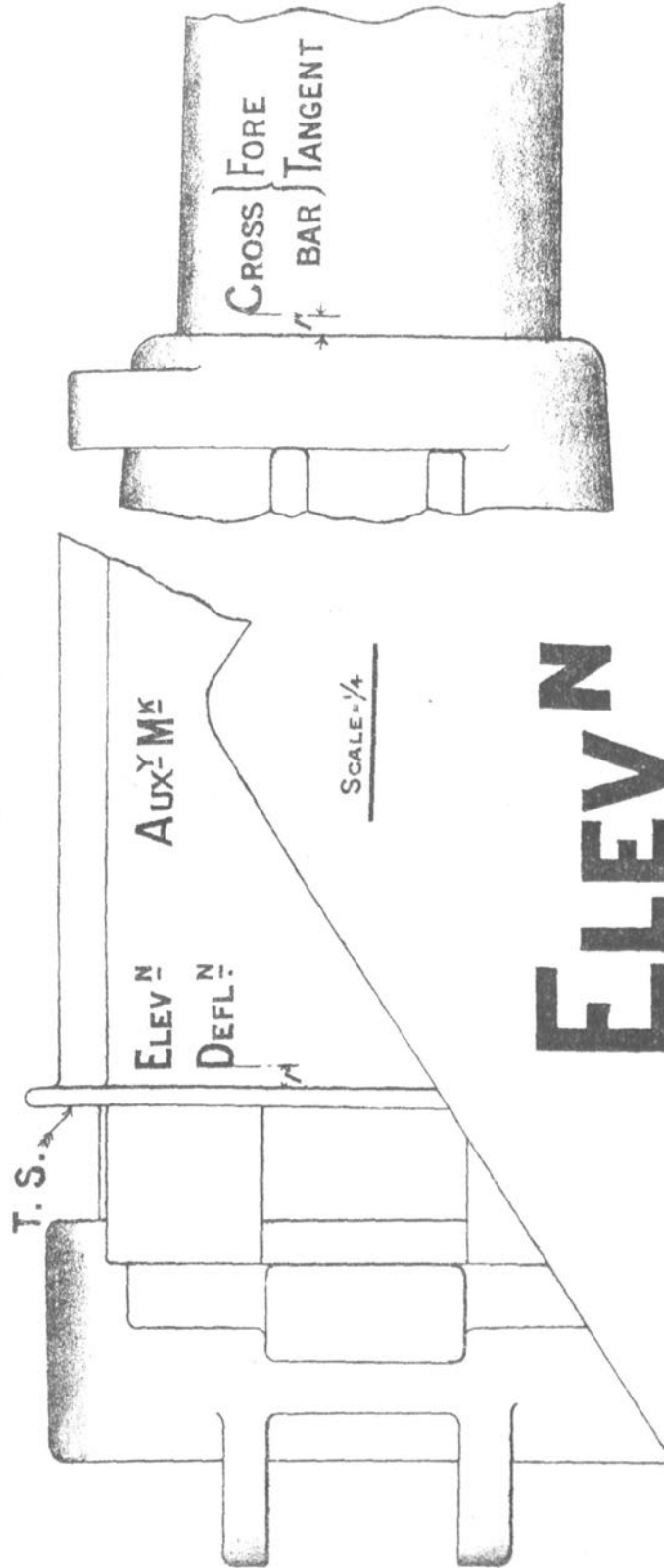
E. LINK.
F. ACTUATING COLLAR.
G. HANDLE, BREECH SCREW.
H. CATCH, CAM LEVER.
J. LEVER, CATCH RETAINING AXIAL VENT

K. CARRIER RING.
L. STOP BOLT
M. LATCH, RETAINING, CARRIER, OPEN.
N. CLIP, RETAINING, CARRIER.



ORDNANCE. B. L., 5 INCH HOWITZER, MARK I.

STENCILLING.

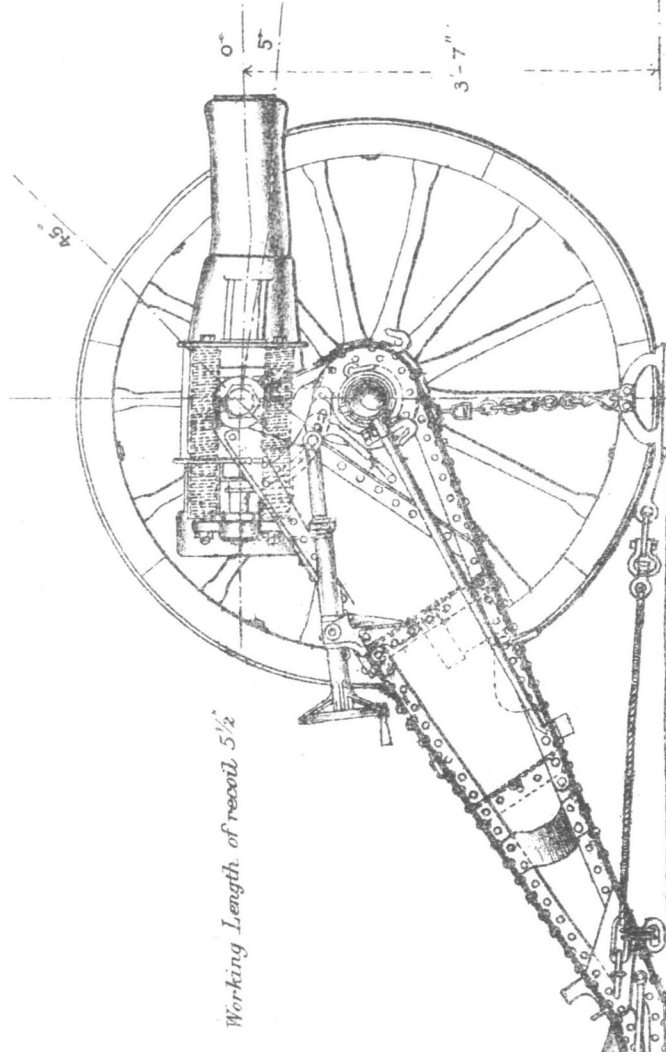


ELEV N

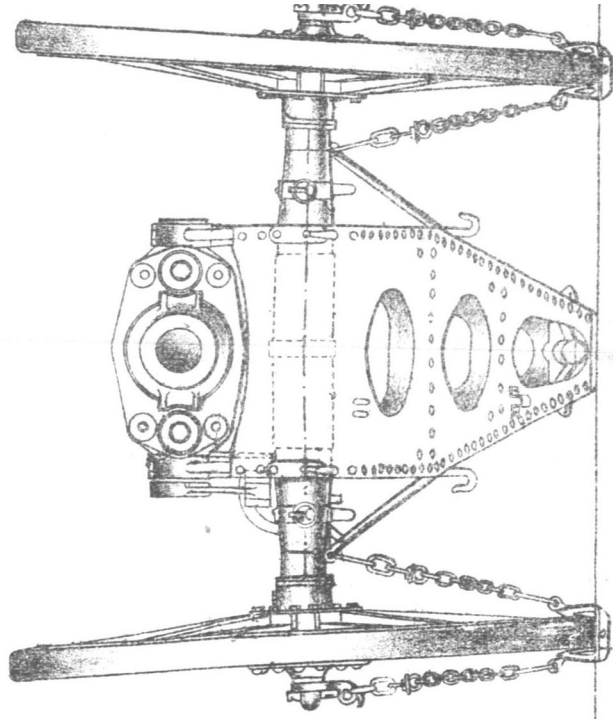
LETTERING FULL SIZE,
TO BE STENCILLED ON IN WHITE PAINT.

CARRIAGE, FIELD, B. L., 5-INCH, HOWITZER, MARK I.

— SCALE = 1/20TH —

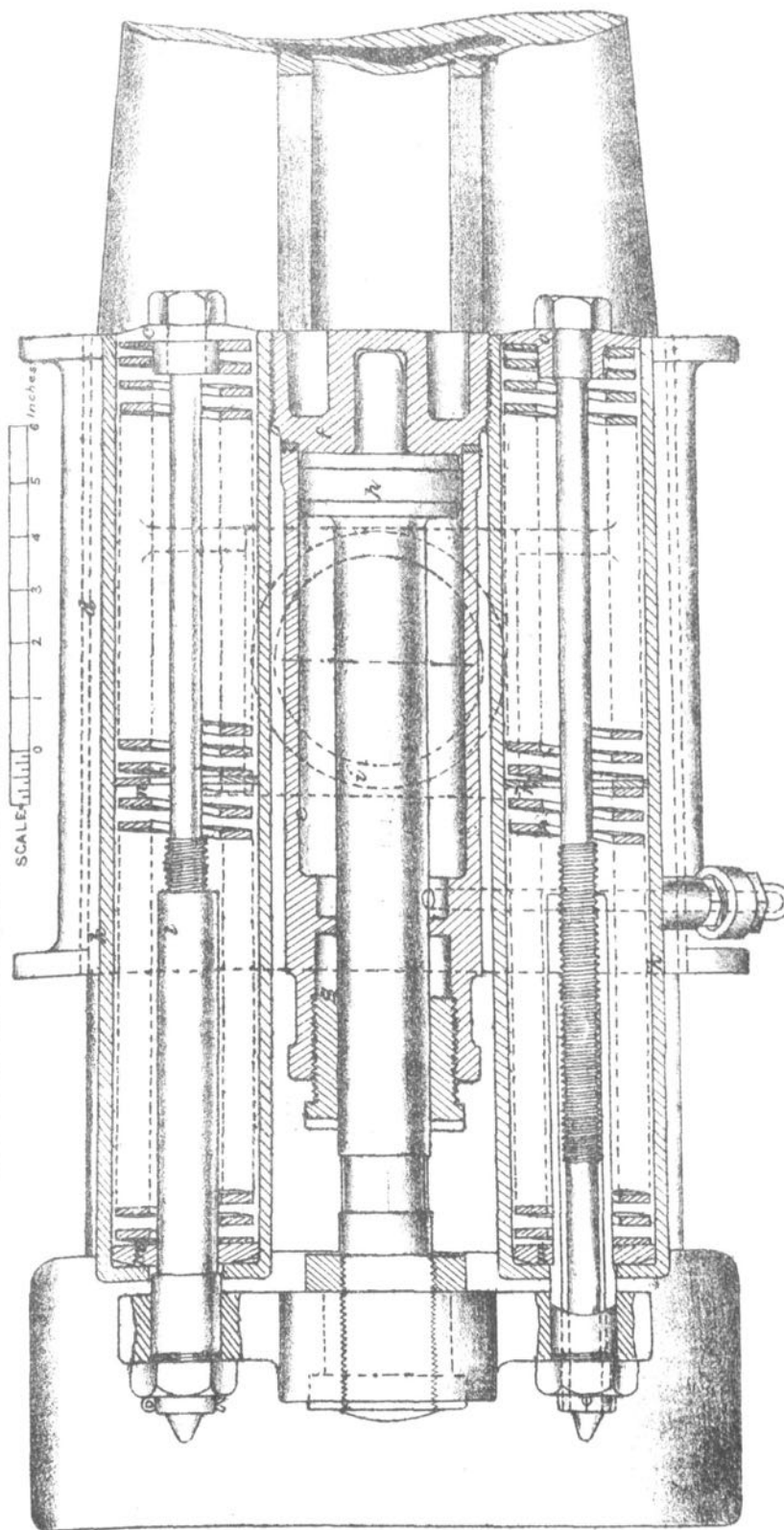


SIDE ELEVATION.



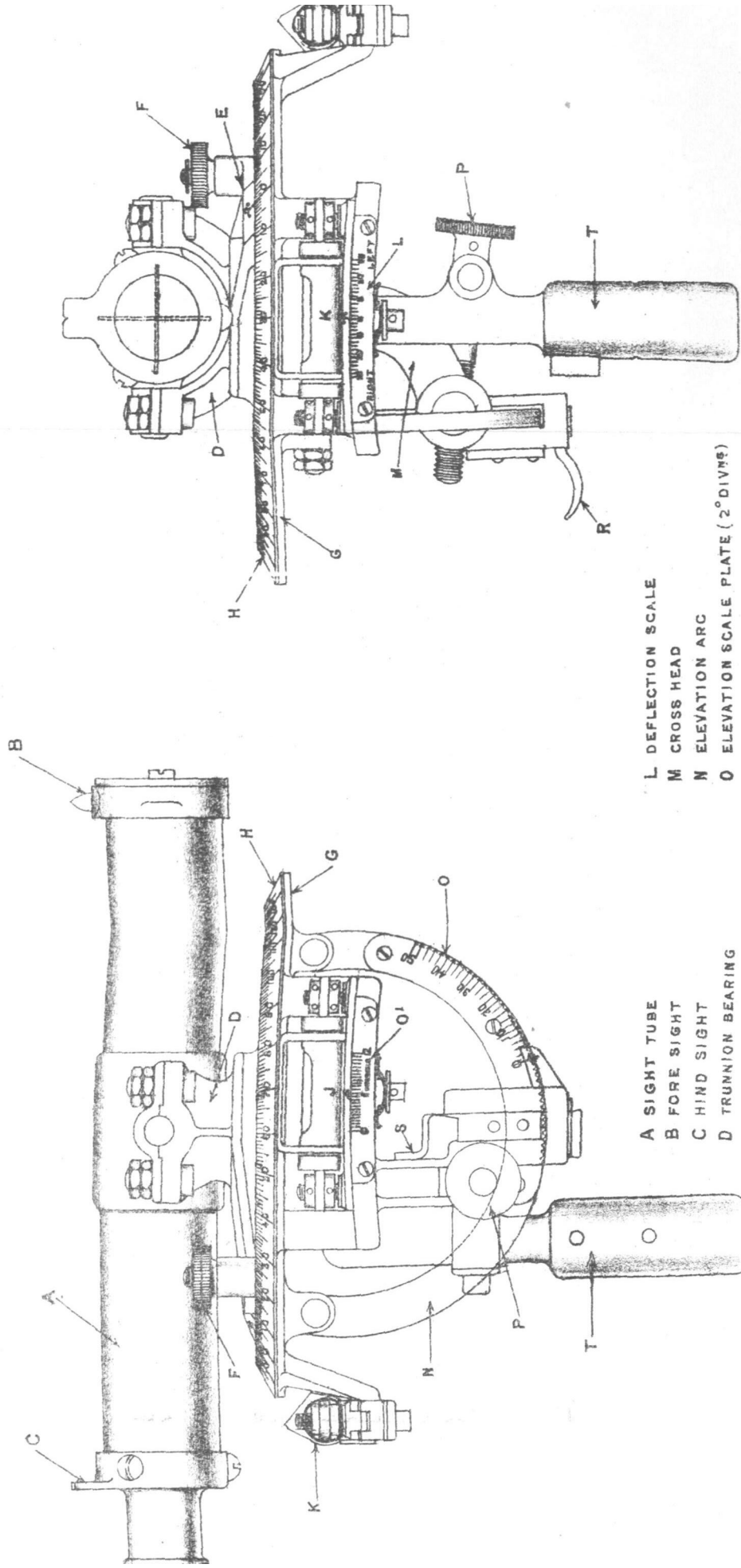
FRONT ELEVATION.

CARRIAGE, FIELD. B.L. 5 INCH HOWITZER, MARK I.



SECTIONAL ELEVATION, SHOWING SECTION OF BUFFER AND SPRINGS.

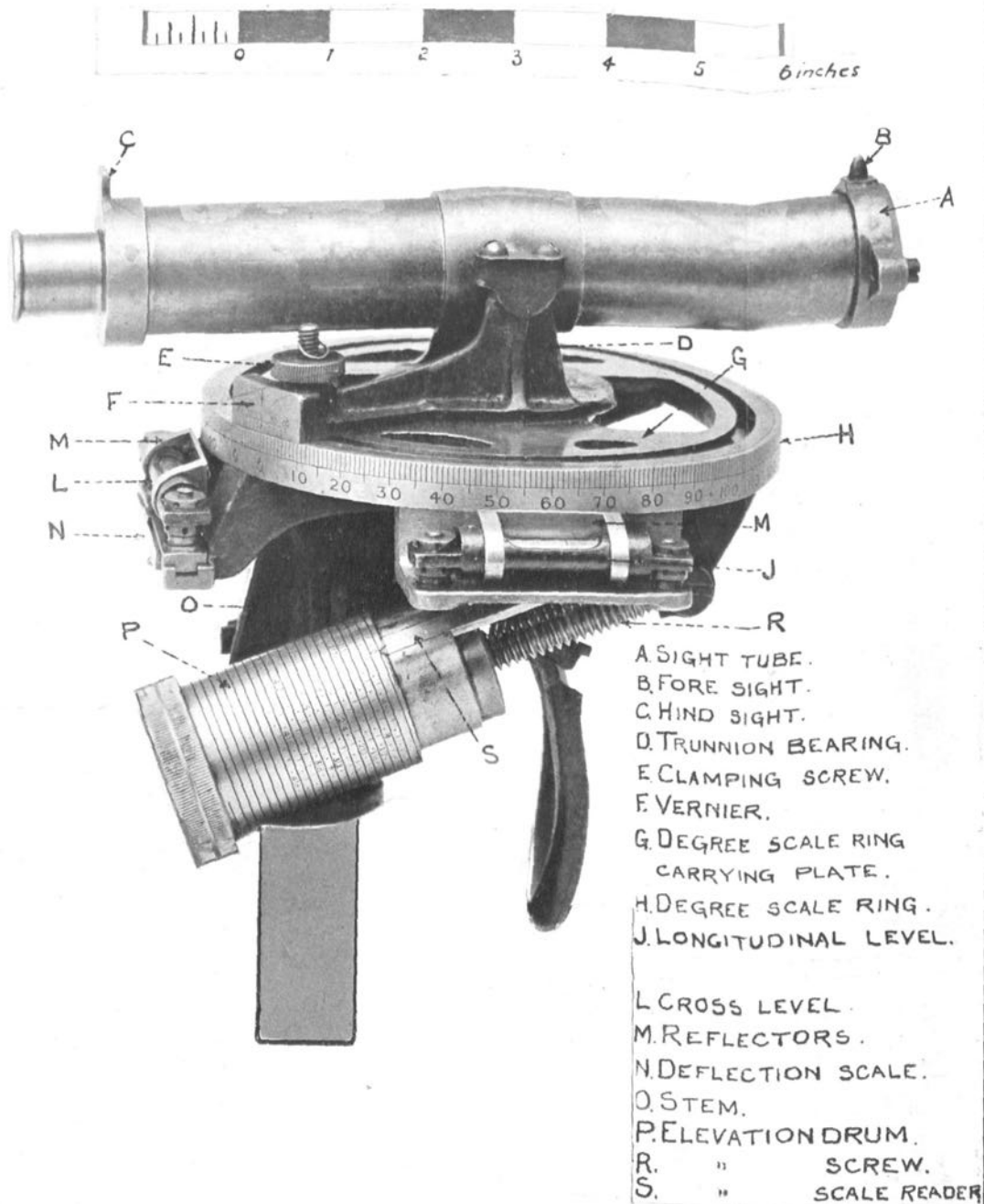
SIGHT, DIAL, N° 3. MARK I.



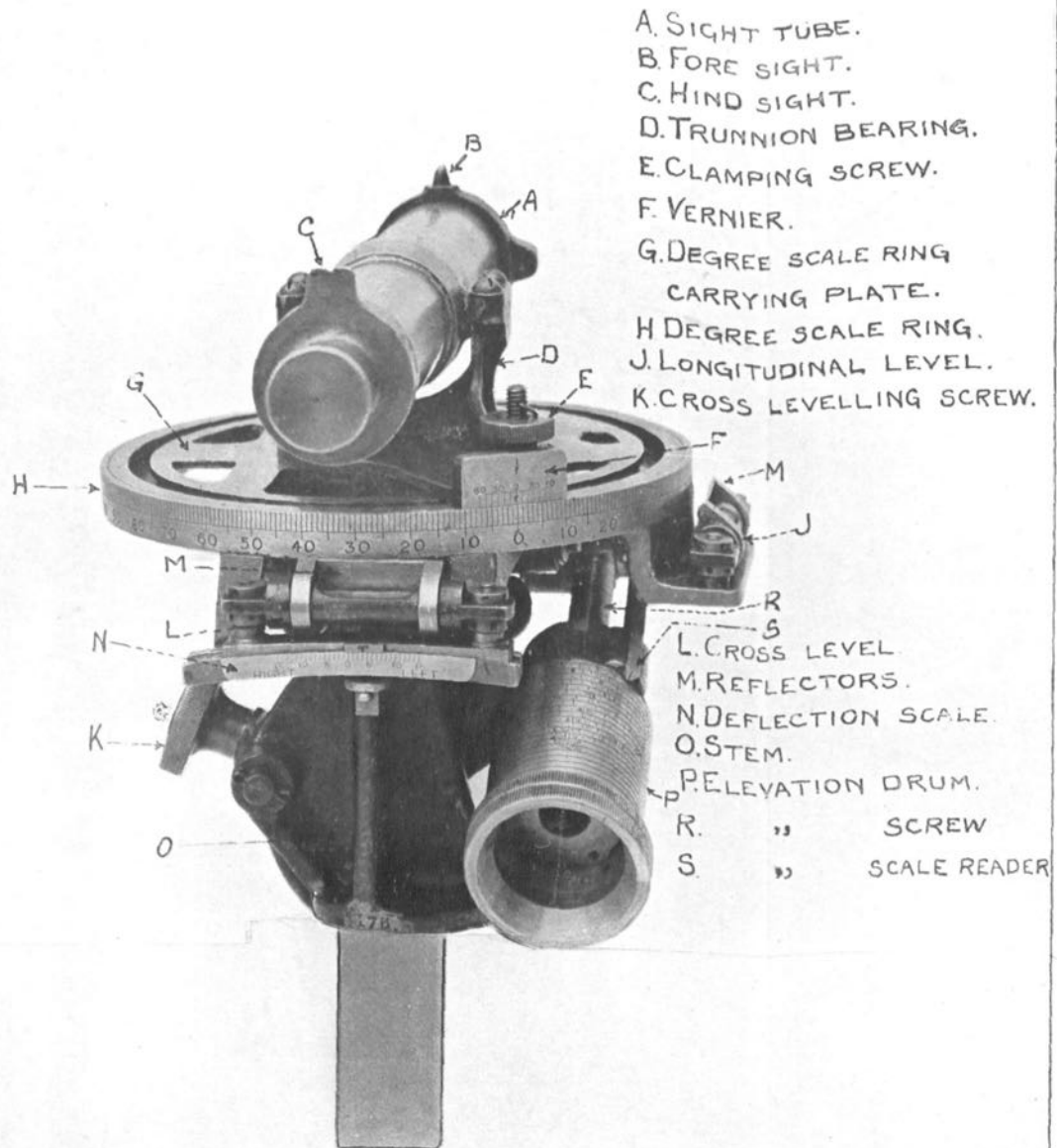
- | | |
|------------------------------------|-------------------------------------|
| A SIGHT TUBE | L DEFLECTION SCALE |
| B FORE SIGHT | M CROSS HEAD |
| C HIND SIGHT | N ELEVATION ARC |
| D TRUNNION BEARING | O ELEVATION SCALE PLATE (2° DIVNS) |
| E INDEX ARM | P LEVELLING SCREW |
| F CLAMPING SCREW | R CATCH STUD |
| G DEGREE SCALE RING CARRYING PLATE | S CATCH SPRING |
| H DEGREE SCALE RING | T STEM |
| J LONGITUDINAL LEVEL | O' ELEVATION SCALE PLATE (5' DIVNS) |
| K CROSS LEVEL | |

SCALE OF INCHES.

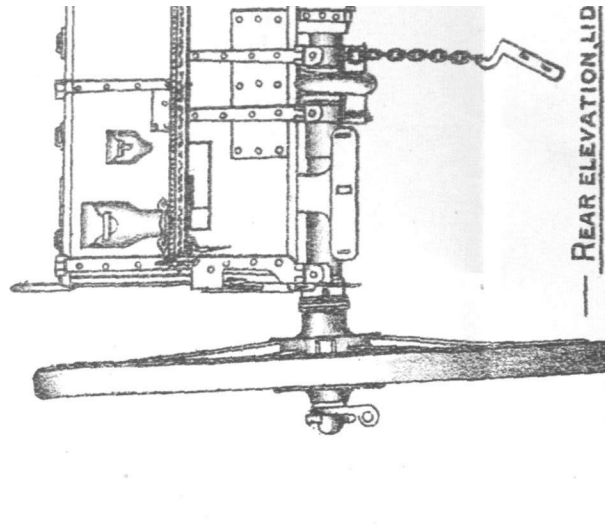
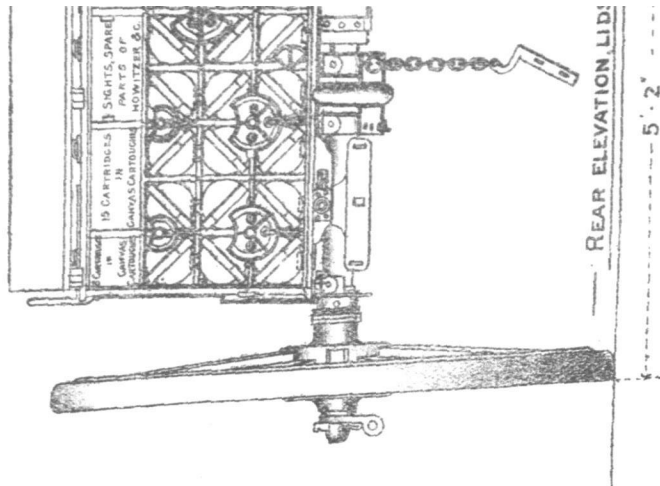
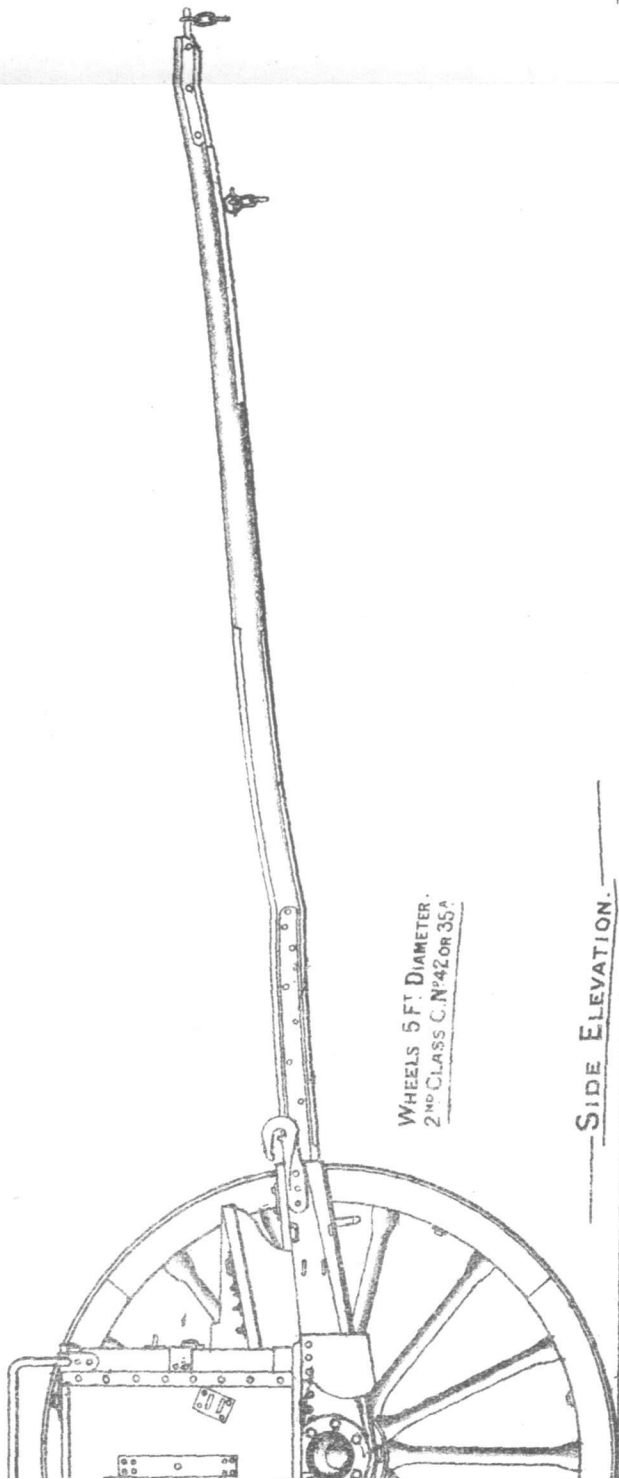
— SIGHT, DIAL, N°3, MARK II. —



— SIGHT, DIAL, N^o3, MARK II. —



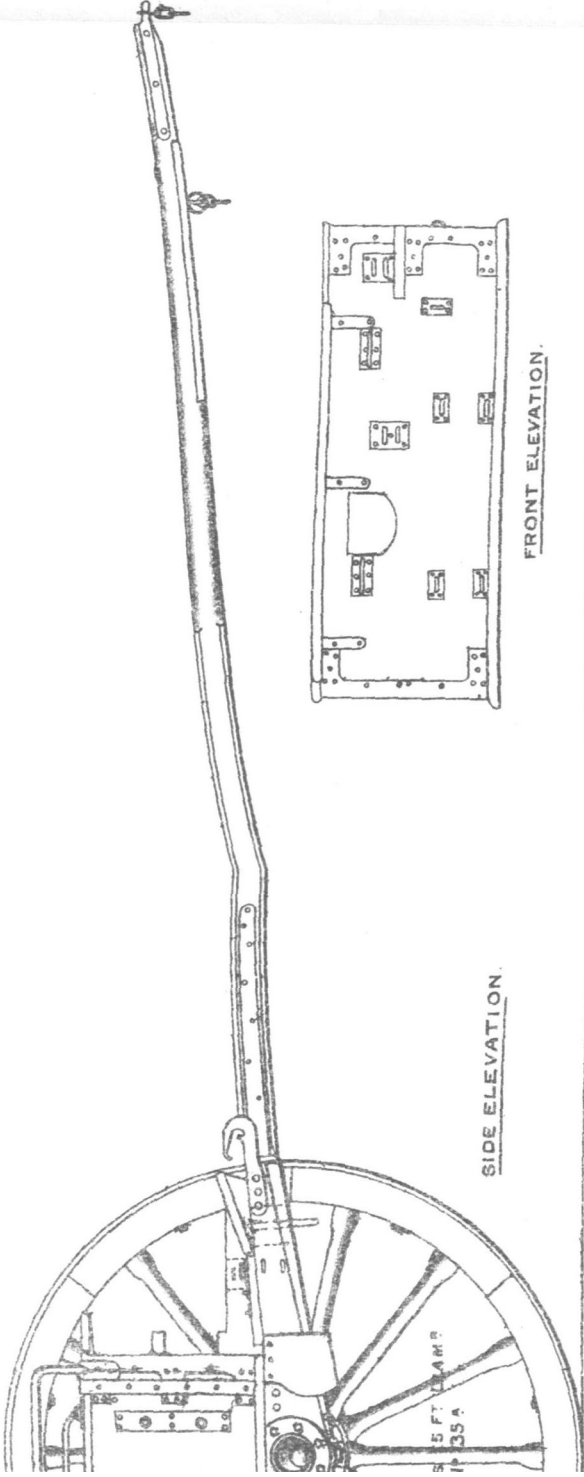
Scale =  6 inches.



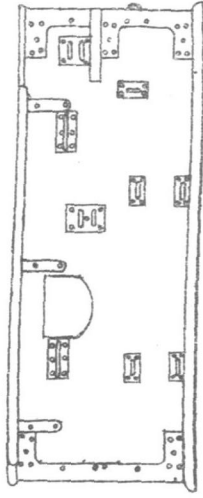
NUMBER, B.L. 5-INCH, HOWITZER, { CARRIAGE. } MARK I.
{ WAGON. }

SCALE - 1/20.

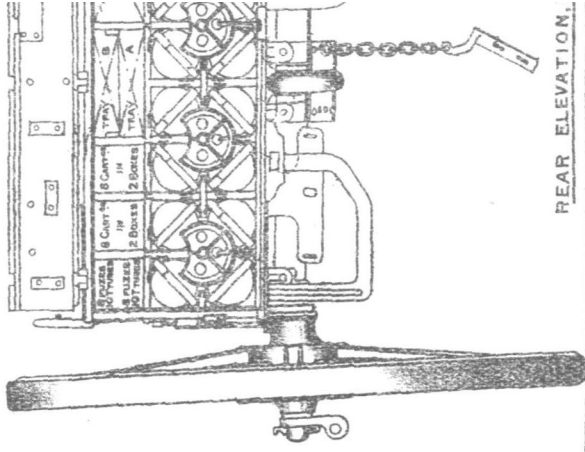
SCALE 1/20



SIDE ELEVATION.

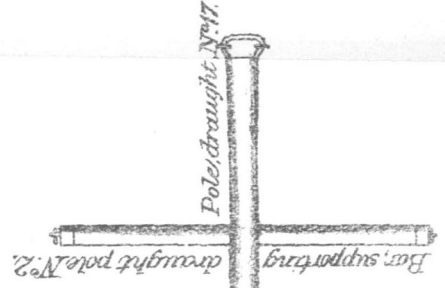
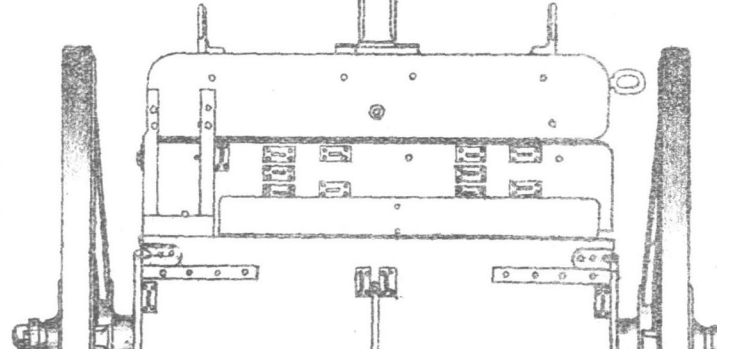


FRONT ELEVATION.



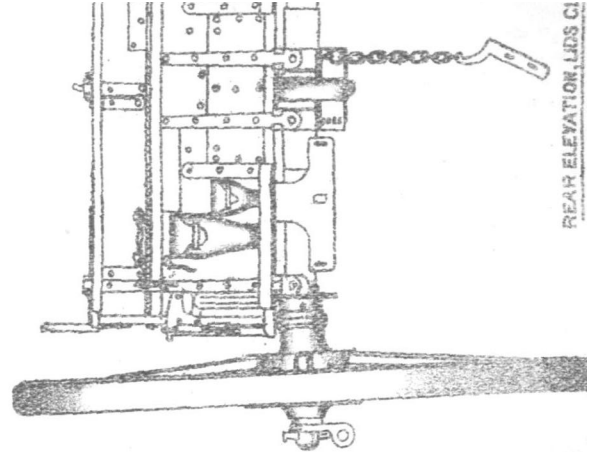
REAR ELEVATION.

PLAN

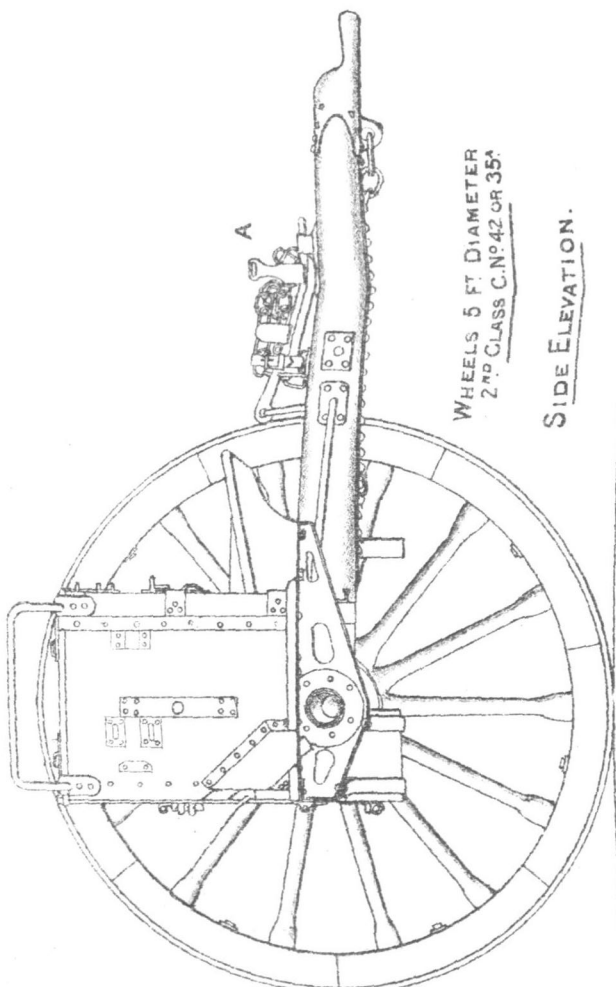


Pole draught No. 17.

Bar supporting draught pole No. 2.



REAR ELEVATION, LIDS CL



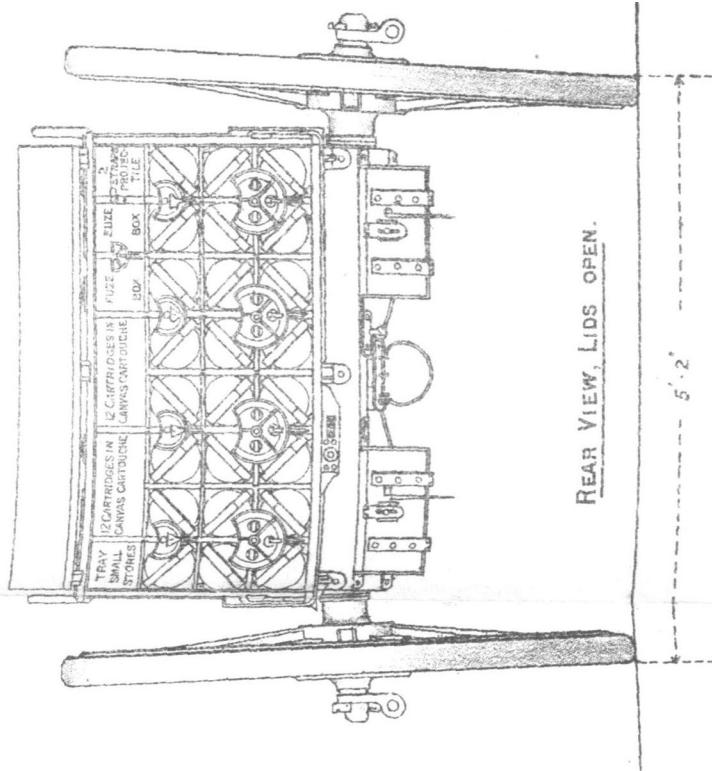
WHEELS 5 FT DIAMETER
2ND CLASS C. NO 42 OR 35A

SIDE ELEVATION.

AGON. AMMUNITION, B.L., 5-INCH HOWITZER, MARK I.

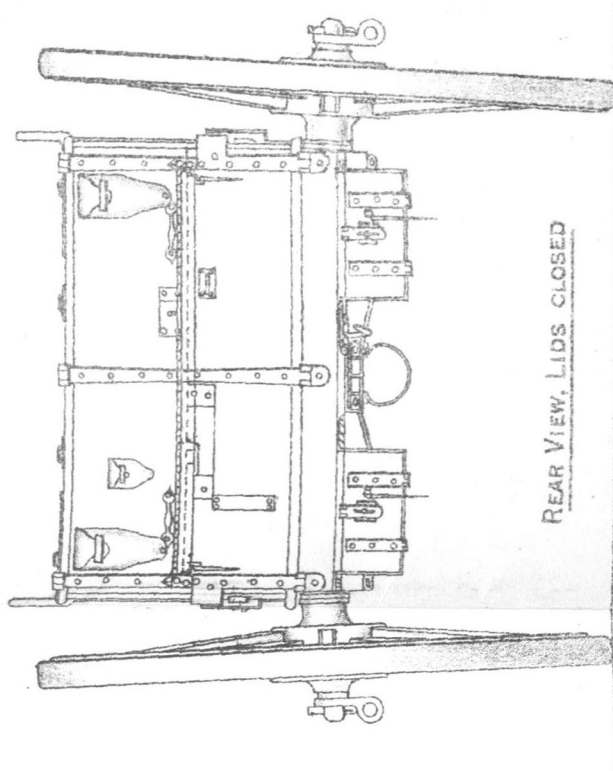
Scale $\frac{1}{20}$ in.

A. When Wagons are fitted with Tire Brakes, the Dragshoe and Chains are not issued.

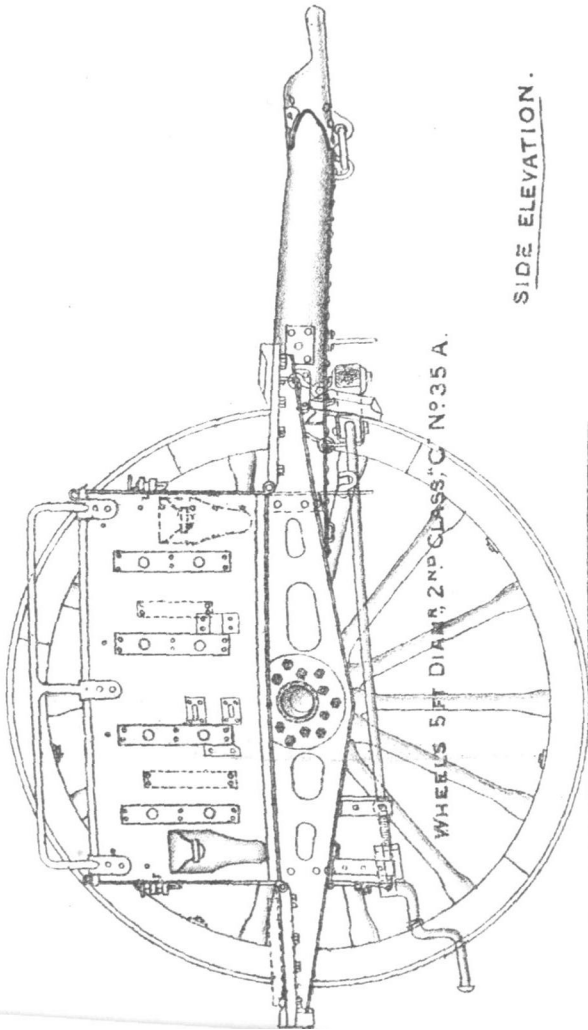


REAR VIEW, LIDS OPEN.

5' 2"

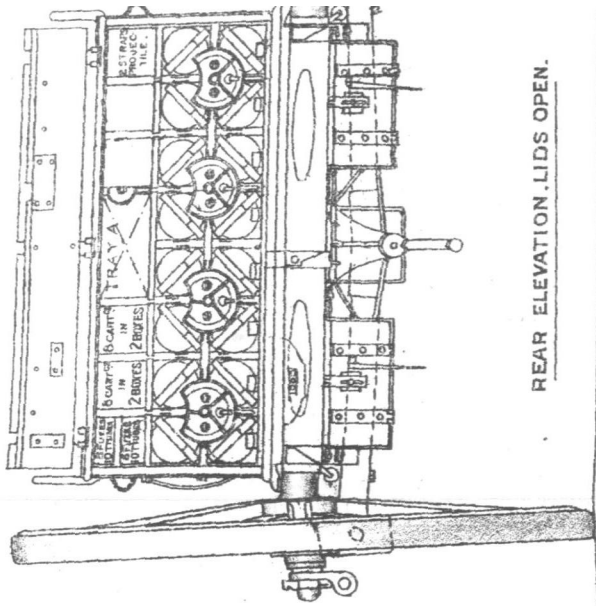


REAR VIEW, LIDS CLOSED



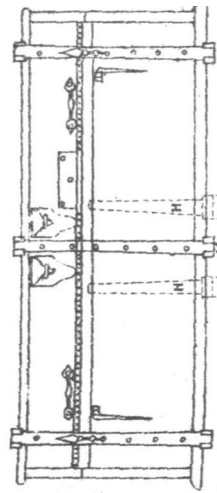
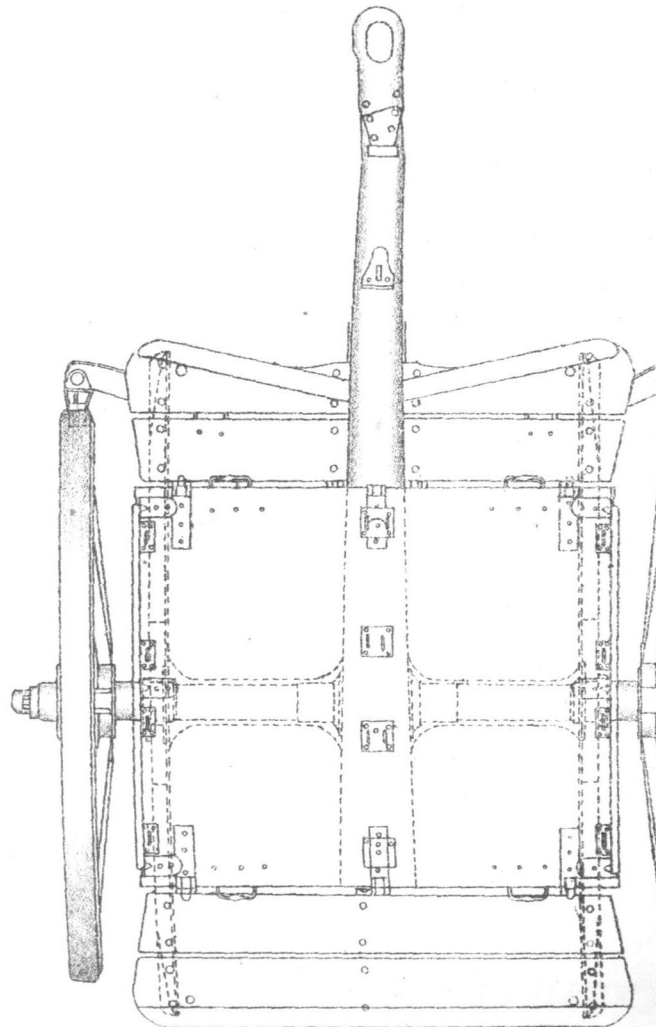
SIDE ELEVATION.

WHEELS 5 FT DIAM, 2ND CLASS, C' N° 35 A.



REAR ELEVATION, LIDS OPEN.

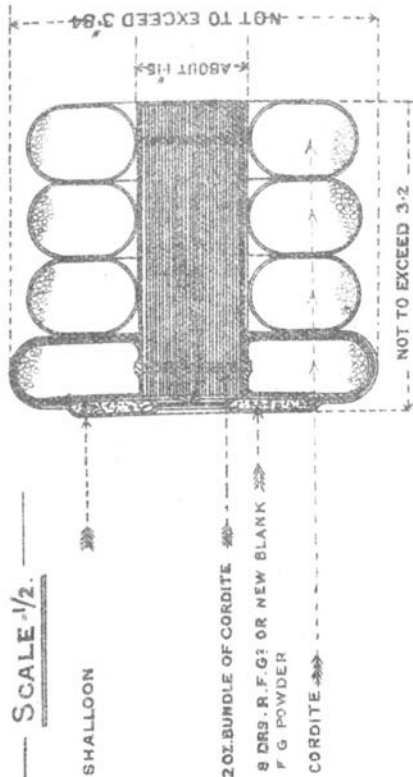
5 FT 2 IN. INCL



REAR ELEVATION OF AMMUNITION BOX, LIDS CLOSED ALSO
FRONT ELEVATION WITH 2 CENTRE HINGES H.H. IN LIEU
OF K.

CARTRIDGE, B.L., 5 INCH HOWITZER, 11⁷/₁₆ OZS. CORDITE, SIZE 3³/₄, MARK II.

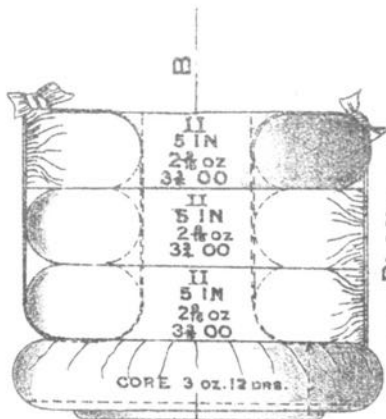
SCALE ¹/₂.



SECTION AT A.B.



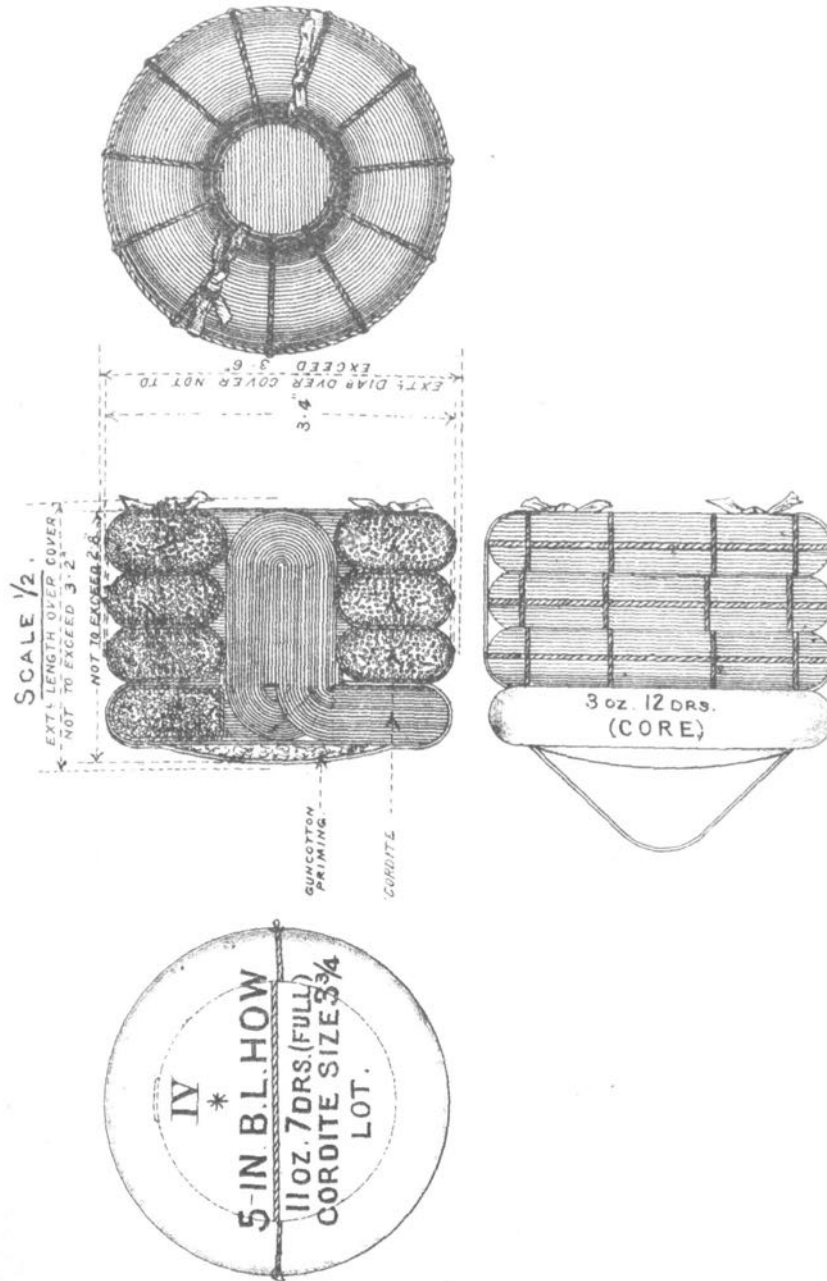
PLAN OF BASE.



PLAN.

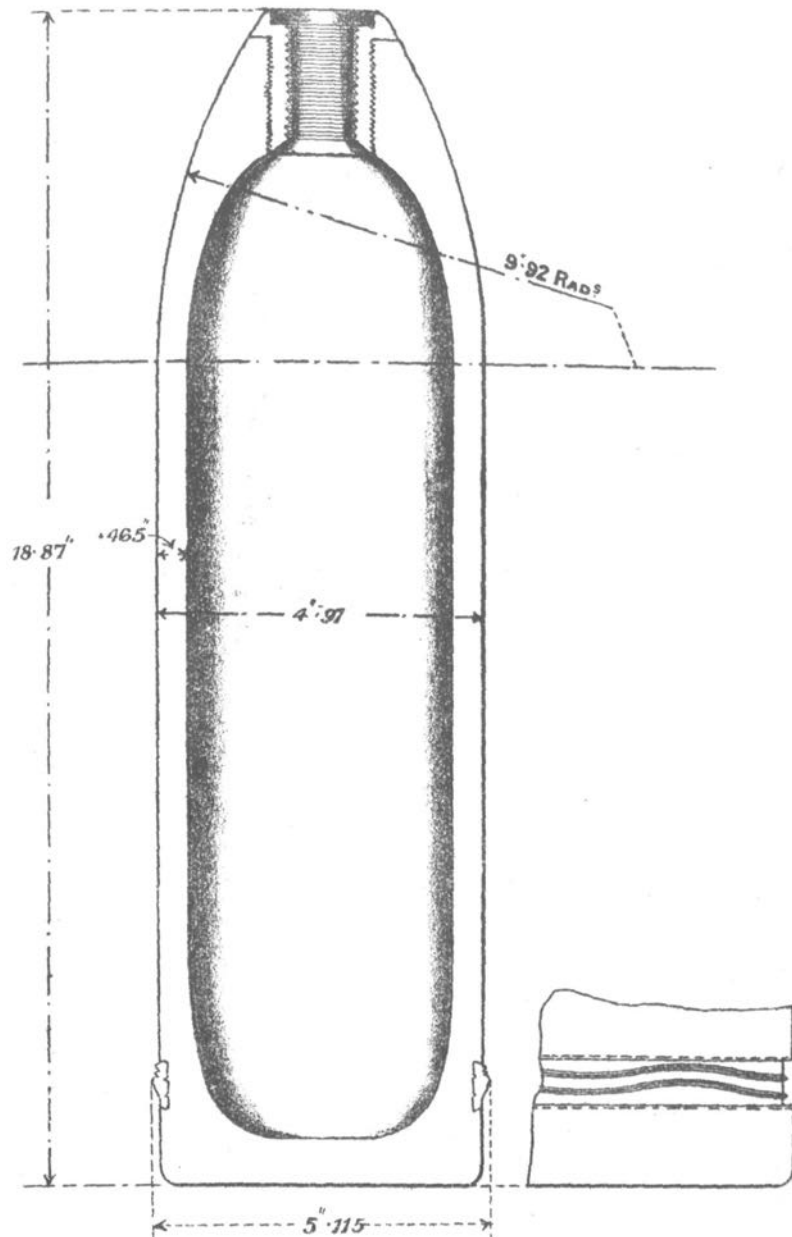
PLAN OF END.

CARTRIDGE, B.L. 5-INCH HOWITZER, 117¹⁶-OZS. CORDITE, SIZE 3³/₄, MARK IV.



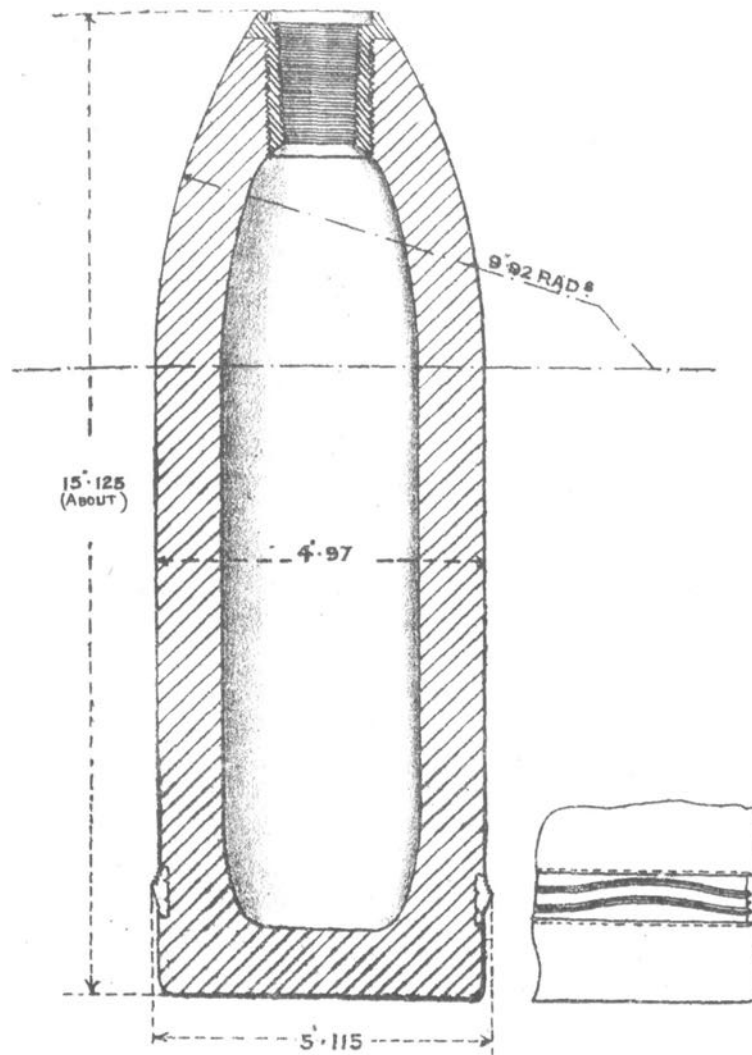
SHELL, B.L., COMMON, LYDDITE, 5 INCH HOWITZER, MARK IV.

— SCALE $\frac{1}{3}$. —



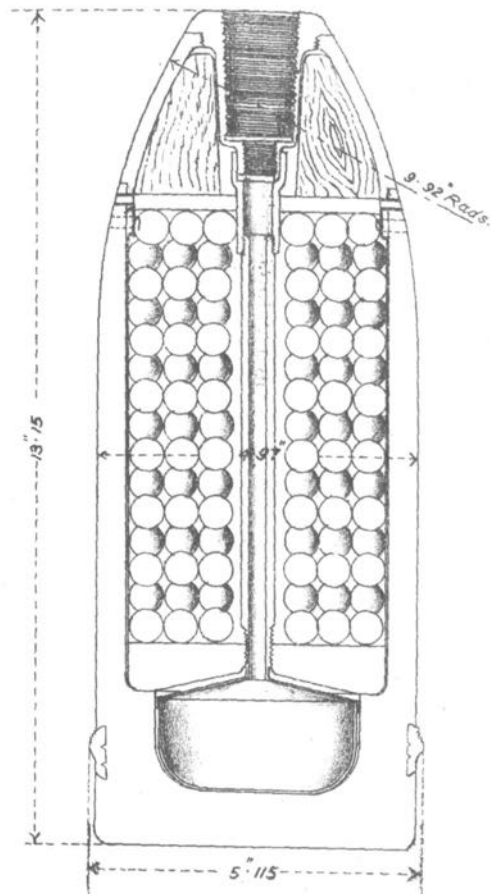
SHELL, B. L., COMMON, 5 INCH HOWITZER, IRON, MARK III.

SCALE = $\frac{1}{3}$.



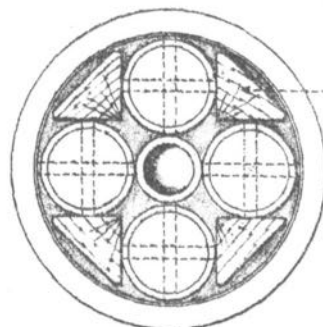
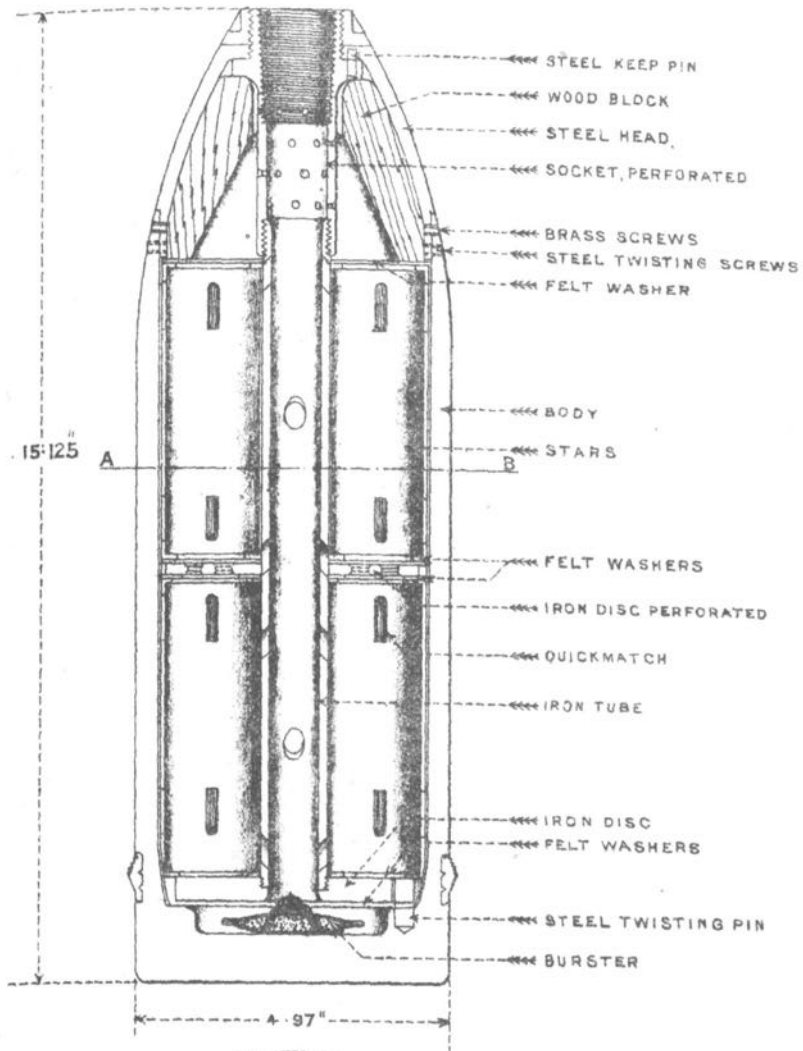
SHELL, B. L. SHRAPNEL, 5 INCH, HOWITZER, M^K VII.

Scale = $\frac{1}{3}$.



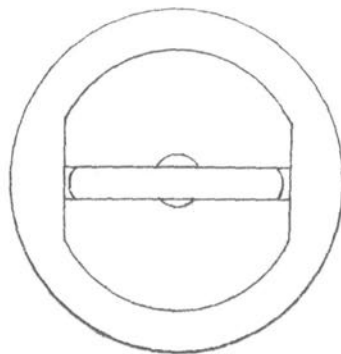
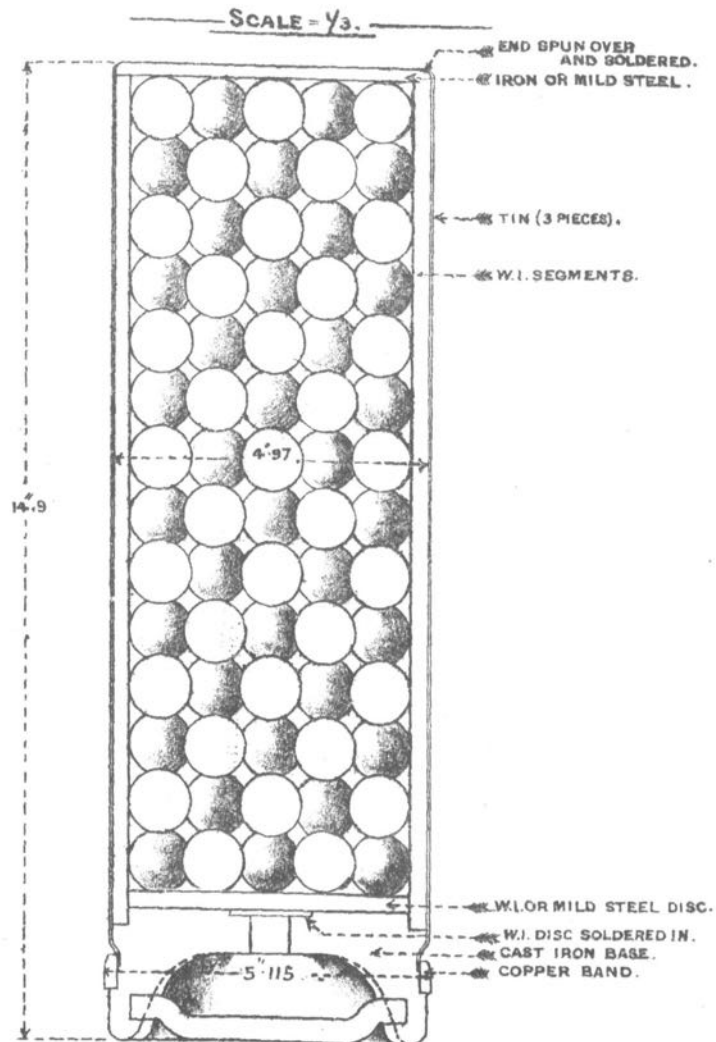
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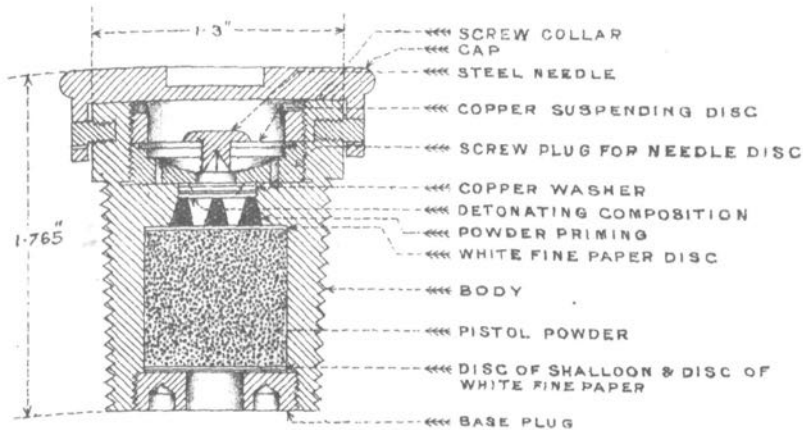


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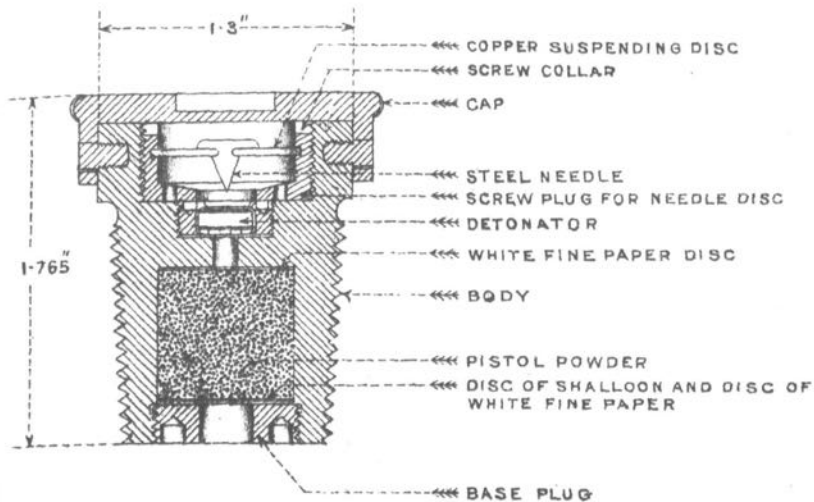
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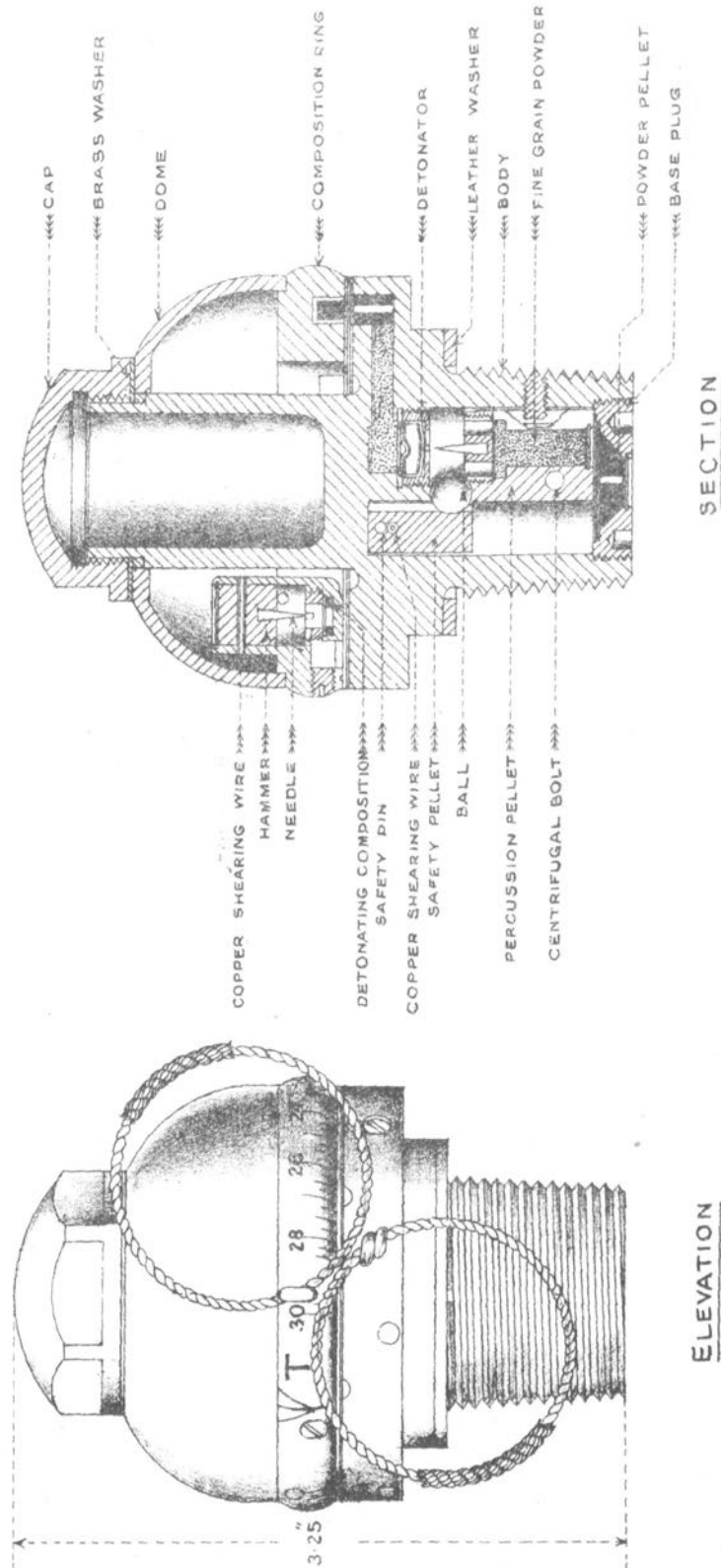
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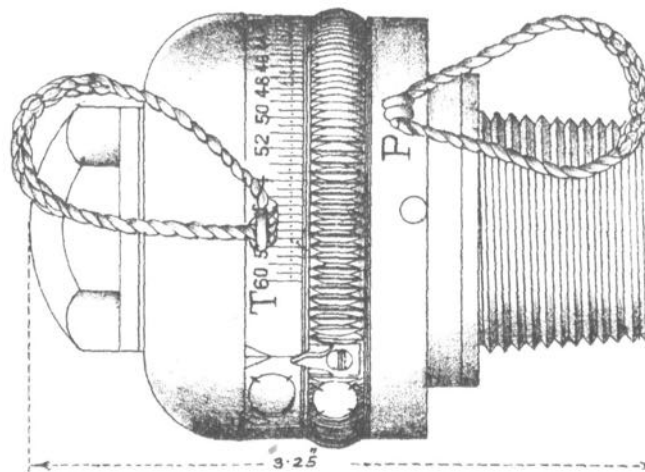
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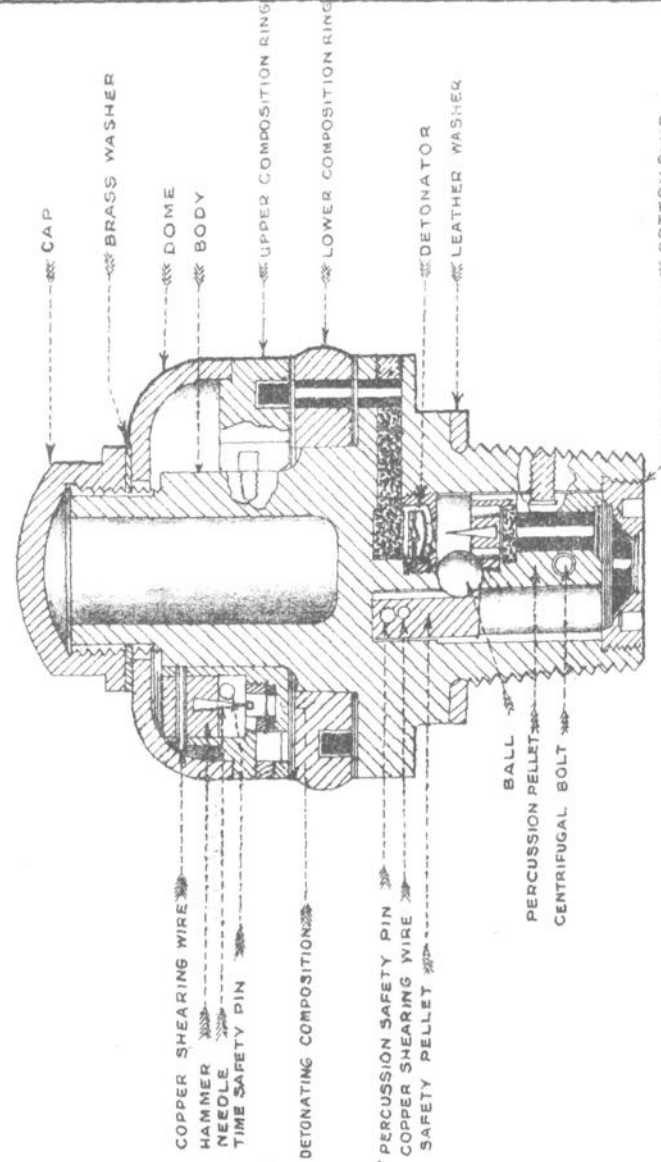


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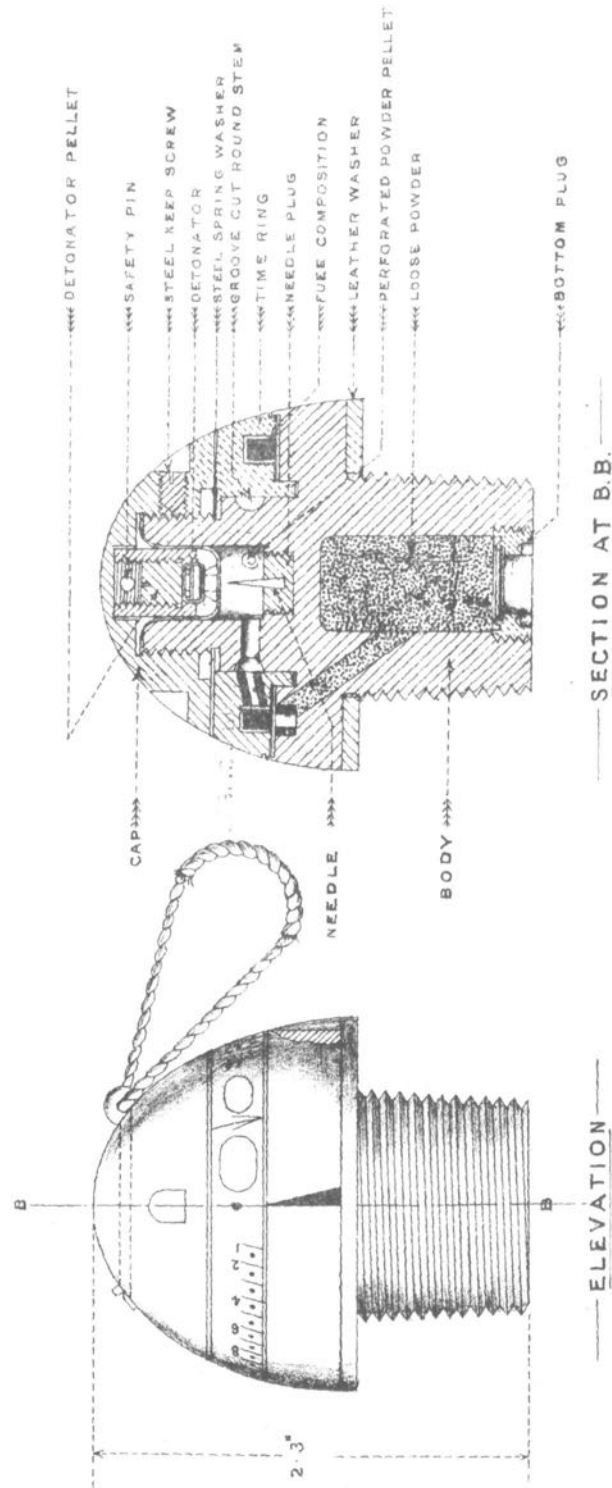
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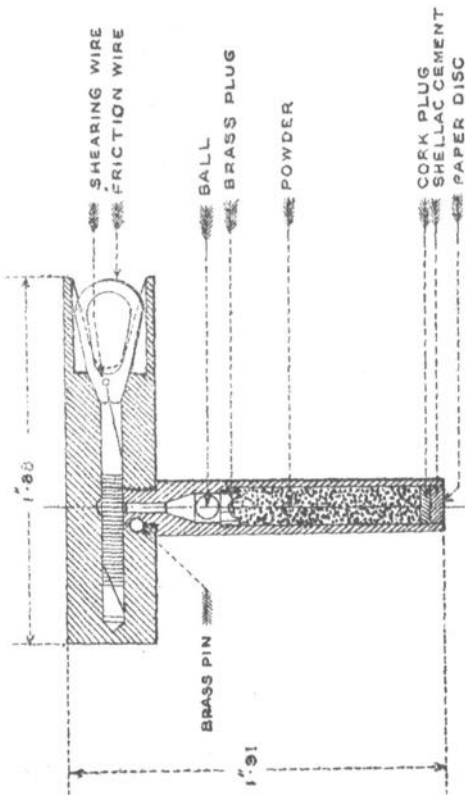
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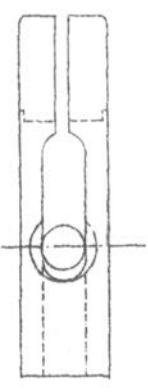
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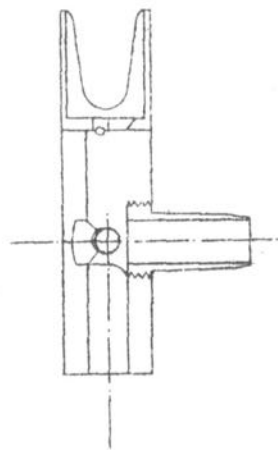
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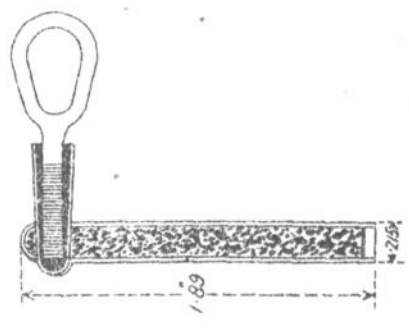


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